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General System Performance Specification

for the

Defense Meteorological Satellite Program

APPROVED:

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Date: 6 Sep 1983

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SECTION 1

SCOPE

1.1 PURPOSE

This specification sets forth the performance, design, development, construction, test, and operational support requirements of the Defense Meteorological Satellite Program (DMSP).

1.2 CLASSIFICATIONS

None Applicable

SECTION 2

APPLICABLE DOCUMENTS

2.1 GOVERNMENT DOCUMENTS

The **following documents** form a part of this specification to the extent specified herein. lhless specified otherwise, the issue in effect will be the current version and all approved changes thereto. In the event of conflict between the documents referenced herein and the contents of this specification, see 3.8.

SPECIFICATIONS:

Federal

Reserved

Military

Reserved

Program Specifications

SS-YD-854	**Command,** Control **& Communication** Segment Performance Specification
SS-YD-855	User Segment **Performance** Specification
SS-YD-860	Space Segment Performance Specification
IS- m-853	**Block 5D-2** Space **Segment/Ground** Systems Interface Specification

IS-YD-861	Block 5D-2 Command, Control and Communications/User Segment Interface Specification
SCAP Vol. I-V	Defense Meteorological Satellite Program System Concepts and Procedures
DMSS-100	Defense Meteorological Satellite System System Requirements Document

STANDARDS

Military

MIL-STD-130F 21May 82	Identification Marking of U.S. Military Property
MIL-STD-756B 18 Nov 81	Reliability Modeling and Prediction
MIL-STD-1472B 31 Dec 74 Notice 2 10 May 78	Human Engineering Design Criteria for Military Systems, Equipment and Facilities
MIL-STD-1538 11 Apr 73	Spare Parts and Maintenance Support of Space and Missile Systems Undergoing RDT&E
MIL-STD-1541 15 Oct 73	Electromagnetic Compatibility Requirements for Space Systems
MIL-STD-1542 15 Apr 74	Electromagnetic Compatibility and Grounding Requirements for Space System Facilities

MIL-STD-1543 Reliability Program Requirements for
15 Jul 74 Space and Missile Systems
Notice 1
10 May 76
Notice 2
22 Jul 77

MIL-STD-45662A Calibration System Requirements
10 Jan 80

OTHER PUBLICATIONS:

Regulation and Requirements

NSA-CSESD-1J (S-COMSEC) Communications Security Equipment
Mar 81 System Document for TSEC/KG-28

NSA-CSESD-7K (S-COMSEC) Comnunications Security Equipment
Jun 82 System Document for TSEC/KG-29

NSA-CSESD-8H (S-COMSEC) Communications Security Equipment
Jul 81 System Document for TSEC/KG-43/44

NSA-CSESD-10I (S-COMSEC) Communications Security Equipment
Jul 81 System Document for TSEC/KG-46

NSA-CSESD-17A (S-COMSEC) Comnunications Security Equipment
Mar 81 System Document for TSEC/KG-57/HS-57

NACSEM 5100 (C) Compromising Emanations, Laboratory
Mar 74 Test Standards Electromagnetics
Amend 1
19 Nov 75

NACSEM 5109 (C) Mar 73	Tempest Testing Fundamentals
SD-140&F-01-80 (S) chg. 1 1 Dec 80	Threat Assessment Report Space Defense System Program (U)
SD-1400-F-02-80 (S) vol. 1 & 2 1 Dec 80	Threat Environment Description for Space (Space TED) (U)

Directives

PMD R-S 3015/PE35160F Latest Issue	Defense Meteorological Satellite Program
MOA 11 Nov 76	Memorandum of Agreement on the Joint-Service Management and Operation of the Defense Meteorological Satellite Program (DMSP)

Handbooks

MIL-HDBK-217D 15 Jan 82	Reliability Prediction of Electronic Equipment

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specified procurement functions should be obtained from the contracting office or as directed by the contracting officer).

2.2 NON-GOVERNMENT DOCUMENTS

The following documents of the exact issue shown form a part of this specification to the extent specified herein. In the event of conflict between the documents referenced herein and the contents of this specification, see 3.8.

Specifications

GDChVP-8~034 July 81	Defense Meteorological Satellite Program (DMSP Block 5D-2) RCA-Astro Electronics/General Dynamics Convair Interface Requirements Document

OTHER PUBLICATIONS:

TDR 0059(6110-01)-3 Reissue F 15 March 1982	Air Force Satellite Control Facility Space/Ground Interface
ANSI X3.4-1977	Code for Information Interchange (Federal Information Processing Standard, National Bureau of Standards - FIPS PUB 1)
ANSI/IEEE Std 416-1978	IEEE Standard Atlas Test Language

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using federal agencies. The contracting officer should be contacted regarding the availability of any referenced document not readily available from other sources).

SECTION 3

REQUIREMENTS

3.1 SYSTEM DEFIMTION.

The Defense Meteorological Satellite System (DMSS) is a space-based system for the collection of global environmental data and timely distribution of same to Department of Defense (DOD) and other government agency users. The Defense Meteorological Satellite Program (DMSP) encompasses all parts of the DMSS having validated mission requirements, direction, and funding, and for which the DMSP System Program Office (SPO) has specification control authority. The DMSP mission is to provide, on a global basis, timely visible and infrared (IR) cloud cover and other specialized meteorological, oceanographic, and solar-getphysical data required to support worldwide DOD operations and high priority programs. The system is designed to maintain sufficient satellites on orbit at all times to fulfill the mission requirements.

The major functional areas within the system cover all hardware, firmware, and software required to accomplish the DMSP mission and include operational and logistic support functions, computer program maintenance functions, as well as personnel and training functions.

3.1.1 General Description.

The DMSP will be composed of the following three system segments: Space Segment (SS), Command, Control, and Communications Segment (C^3S), and User Segment (US).

The principal function of the Space Segment is to acquire the above-described environmental data continually through its satellite sensors. The data is stored onboard the satellite for a delayed transmission to the Command, Control, and Communications Segment.

Subsequently, the data is relayed to the User Segment for processing and analysis. Provision is made for the transmission of real-time (RT) mission data to tactical elements of the User Segment.

3.1.1.1 **Space Segment.** The Space Segment, described in SS-YD-860, will be composed of satellites along with their Aerospace Support Equipment (ASE), Ground Support Equipment (GSE), and ground facilities. The nominal operational configuration of each satellite will consist of a spacecraft bus, a primary imaging sensor which must provide contiguous coverage at the equator for consecutive orbit revolutions, and a complement of mission sensors to collect specialized meteorological, oceanographic, and solar-geophysical data.

The satellites will generate equipment status telemetry (EST or Status TM) and mission data streams which, on command, are transmitted in real-time to the C3S and the US. In addition, the mission data and EST will be stored onboard continually for subsequent readout by the C3S ground stations. The stored mission data is relayed to the US. The status TM portion of the stored data will be extracted from the data stream and processed by the C3S.

The satellites will provide an integral or separable delta-V capability which, after separation from the ELV and in conjunction with reaction control and attitude determination and control subsystems, will inject the satellite into a sun-synchronous, polar mission orbit with a specified ascending node crossing time.

3.1.1.2 Command, Control, and Communications Segment. The Command, Control, and Communications Segment (C3S), described in SS-YD-854, consists of the Multi-Purpose Satellite Operations Center (MPSOC) and the Fairchild Satellite Operations Center (FSOC). The C3S is supported by the Air Force Satellite Control Network (AFSCN) with the Consolidated Space Test Center (CSTC) and the Consolidated Space Operations Center (CSOC) through its Remote Tracking Stations (RTSs). The C3S will conduct all mission planning, generate real-time and stored program commands, provide computer memory uploads to the space segment, and handle telemetry ingest, processing and post-pass analysis. 004 003 004

The C3S will obtain required data from the Space Defense Operations Center (SPADOC) of the North American Aerospace Defense Command (NORAD) for the reconstruction of accurate ephemerides for each DMSP satellite to be used in the planning of satellite contacts, data acquisitions, and RT mission data transmissions. These data will be uplinked to the satellite for its semi-autonomous attitude determination and control operations, and for inclusion in RT and stored mission data to support acquisition of the orbiting satellites and reconstruction of mission data by the User Segment. The C3S will obtain and control use of the | 004
necessary network of communications satellite link and data-quality land line telephone circuits. Both types of circuits will handle uplink data and downlink status telemetry to facilitate command and control of the satellites under all circumstances. All functional uplink and downlink aspects of the C3S capabilities will be backed up by an alternative mode such as use of the Air Force Satellite Control Network (AFSCN). The C3S will include an Advanced Flight | 004
Vehicle Simulation Facility (AFVSF) which will simulate an operational DMSP satellite in the validation of the uplink and downlink interface of the satellite with the C3S. It may also be used to validate new flight load packages and operating procedures for attitude control, power, and thermal control subsystems.

3.1.1.3 User Segment. The User Segment, described in SS-YD-855, has two major subdivisions: Sites 3 & 29, which constitute the respective interfaces between the C3S on the one hand and the Air Force Global Weather Central (AFGWC) and the Navy Fleet Numerical Oceanography Center (FNOC) on the other; and tactical terminals which utilize DMSP data in a real-time mode. Although neither the AFGWC nor the FNOC are DMSP agencies, both receive and process DMSP data in an operational manner. The AFGWC, located at Offutt AFB, Omaha NE, is the primary user and distributor of DMSP satellite data to AF and Army elements. The FNOC, located at Monterey CA, uses DMSP data for distribution to Navy and Marine Corps elements. Both receive and process DMSP data in combination with other meteorological, solar-geophysical, and oceanographic observations, as applicable, to build and disseminate environmental products, studies, and observations to DOD and other goverment agency users consistent with their requirements.

Data are collected and processed by the AFGWC to support Air Force and Army requirements validated by the Joint Chiefs of Staff (JCS) on the basis of Statements of Operational Need (SONs) generated by the Air Weather Service (AWS) of the Military Airlift Command (MAC). These requirements include data on cloud cover, vertical moisture and temperature profiles, albedo, visibility, precipitation, winds, surface temperature, snow and landlocked ice cover, soil moisture, clear air turbulence, and ionospheric characteristics. Detailed requirements such as parameter ranges, accuracies, timeliness of product delivery, and data refresh rates are contained in the System Requirements Document (SRD, DMSS-100).

The FNOC utilizes the DMSP mission data to provide meteorological and oceanographic products to the operational elements of the Navy and Marine Corps. It processes those DMSP sensor data which constitute the primary basis for, or provide significant additional inputs to, its analysis and forecast capability in support of naval operations.

Oceanographic data specified by the Chief of Naval Operations (CNO) in Navy Operational Requirements (ORs) include sea surface temperature and sea vertical temperature profile data, in addition to JCS-validated requirements for sea state (significant wave and swell height) and sea ice (bergs and leads). ORs also specify terrestrial requirements for snow and ice cover, soil moisture, and geoid characteristics, and atmospheric requirements for cloud cover, vertical moisture and temperature profiles, visibility, precipitation, winds, and surface temperature. DMSS-100 contains detailed requirements.

The AFGWC will have the capability of acquiring cloud cover imagery, meteorological and other environmental data directly from domestic commercial satellites operated by the National Oceanic and Atmospheric Administration (NOAA) in polar and geosynchronous equatorial orbits.

The group of real-time tactical terminals will consist primarily of land and shipboard transportable systems deployed to provide support to major

theater and unit commands of the DOD and other government agencies. Some of the terminals will be fixed or permanently based.

These self-contained terminals will process real-time mission data in direct support of Air Force, Navy, Army, and Marine Corps field operations. They will receive, process, and display RT mission data transmitted by the DMSP satellites as well as additional environmental data from domestic commercial satellites in polar orbit and from domestic and foreign satellites in geosynchronous equatorial orbits.

The units will include a programmed or automatic tracking capability and receiving, decryption, display and recording systems. The display subsystem will provide the capability for displaying visible or infrared data on a CRT (soft copy), or by way of a positive transparency (hard copy). The recording system will enable the operator to reproduce, post-pass, real-time data for further processing.

Shipboard terminals, as well as Navy shore-based and USMC transportable units, are procured by the U.S. Navy to provide performance similar to that specified for real-time ground terminals. The Navy shipboard and shore-based terminals are considered part of the US in a functional sense only, hence do not have their configuration specified herein beyond the requirement for their interface with the other DMSP-controlled segments.

3.1.2 Mission. The primary mission of the Defense Meteorological Satellite Program (DMSP) is to collect and disseminate--through all levels of conflict, consistent with the survivability of the supported elements--global visible and infrared cloud cover imagery in support of worldwide DOD operations and hi&priority programs. In addition, the DMSP will collect and disseminate other specialized mete orological, oceanographic, and solar-geophysical data to the DOD and other government agencies. These data will be gathered continuously by the sensor payload onboard the satellite, transmitted in real-time --on stored or RT command--for direct readout of local area environmental data by components of the US, and stored along with

state of health data onboard the satellite for subsequent transmission to the C^3S ground stations. The stored data (sensor and status TM combined) are read out and relayed in a timely manner to elements of the US and C^3S, respectively, for processing and distribution. The stored status telemetry is relayed to the C^3S for processing and analysis.

3.1.3 Threat. The Defense Meteorological Satellite System is subject to the threat environment defined in SD-1400-F-01-80 (S) and SD-1400-F-02-80 (S).

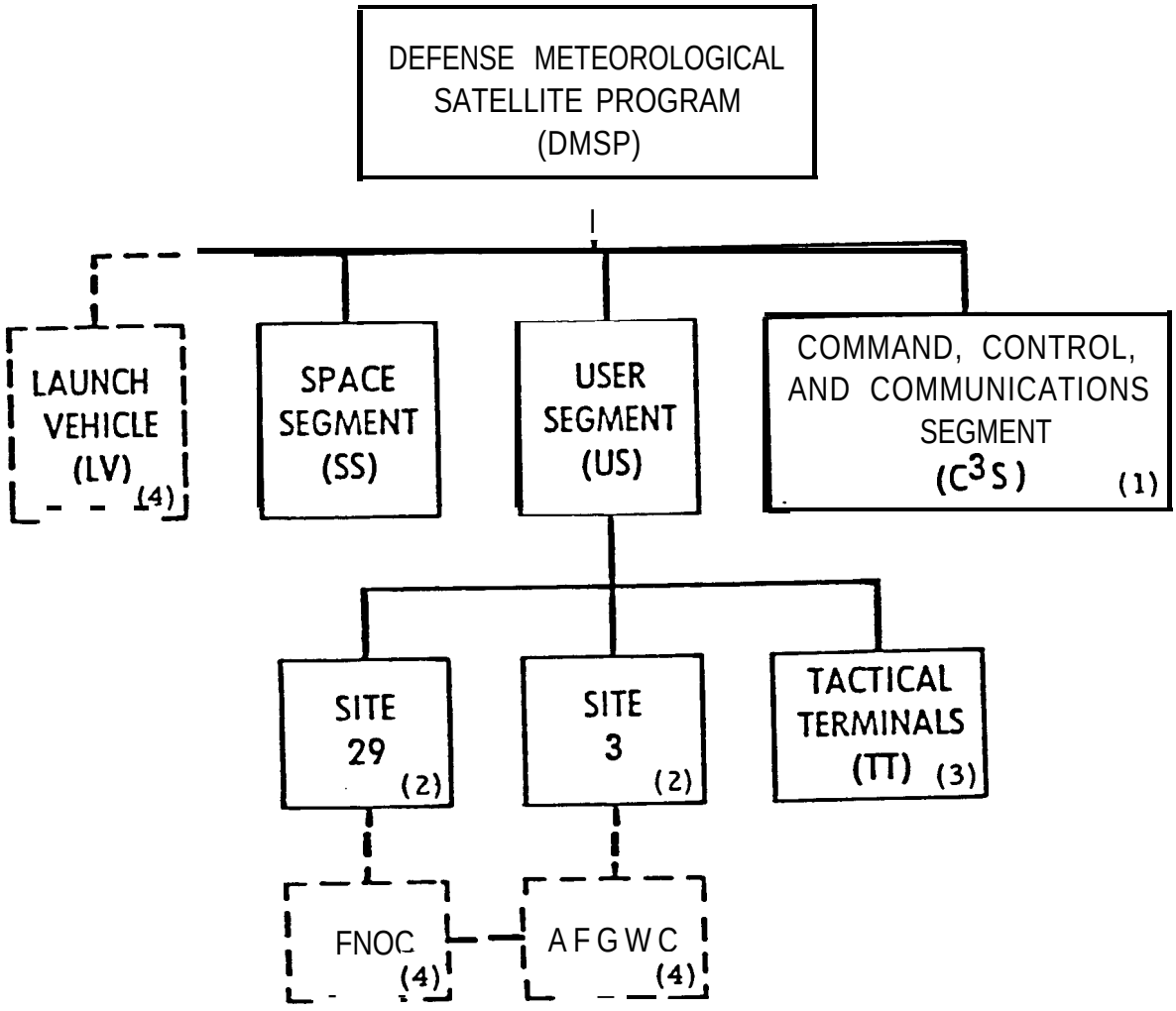
3.1.4 System Diagram. The system diagram for the DMSP is shown in Fig. 3.1-l.

3.1.4.1 System-Level Data/Command Flow Diagram. The principal DMSP functions involve flow of data and commands between operating segment elements. The system-level data/command flow structure is shown in Figure 3.1-2.

3.1.4.2 Specification Tree. The specification tree for the DMSP is shown in Fig. 3.1-3.

3.1.5 Interface Definition. This section defines the interfaces between the DMSP Segments as reflected in Figures 3.1-1, 3.1-2, and 3.1-3. They are further specified in Section 3.7 and in the applicable inter-segment interface documents.

3.1.5.1 SS-Ground System Interface. This interface, described in IS-YD-853, encompasses the up- and downlink radio frequency (RF) and data interfaces required for the C^3S, its backup elements, and the US. The RF interfaces include the exercise of command and control by the C^3S over the satellites using the uplink and RT EST downlink, as well as the downlink transmission of RT and stored mission and EST data. In addition, it covers the data formats for each of these services.



(1) - Portions of C^3S are physically located in Sites 3 and 29

(2) - Specifications controlled by DMSP

(3) - Air Force/Marine Corps terminal specifications controlled by DMSP
- Navy ship- and shore-based terminal specifications controlled by USN

(4) - Controlled by other agencies, not part of DMSP

Fig. 3.1-1. DMSP System Diagram

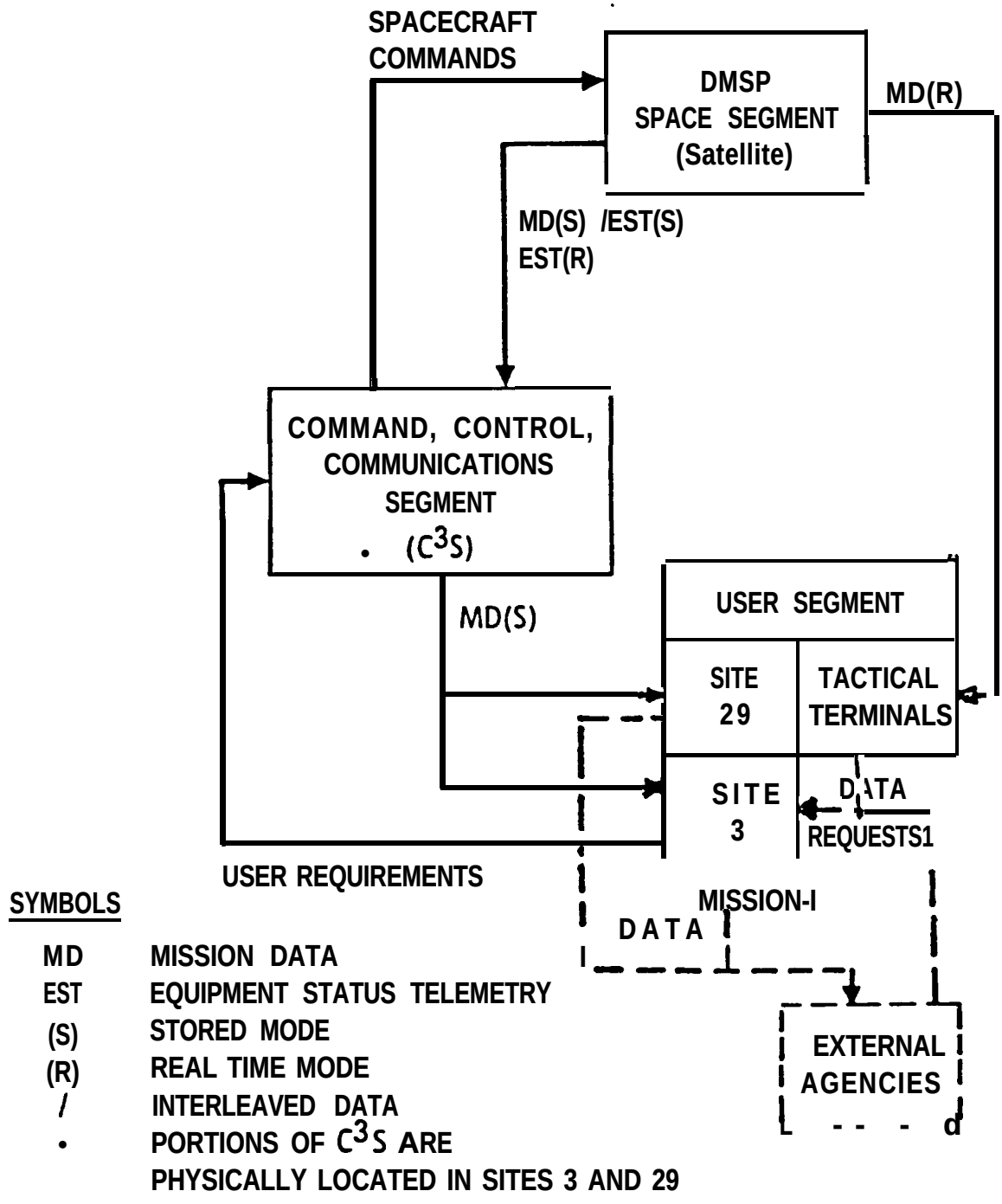


Fig. 3.1-2. System Data/Command Flow Diagram

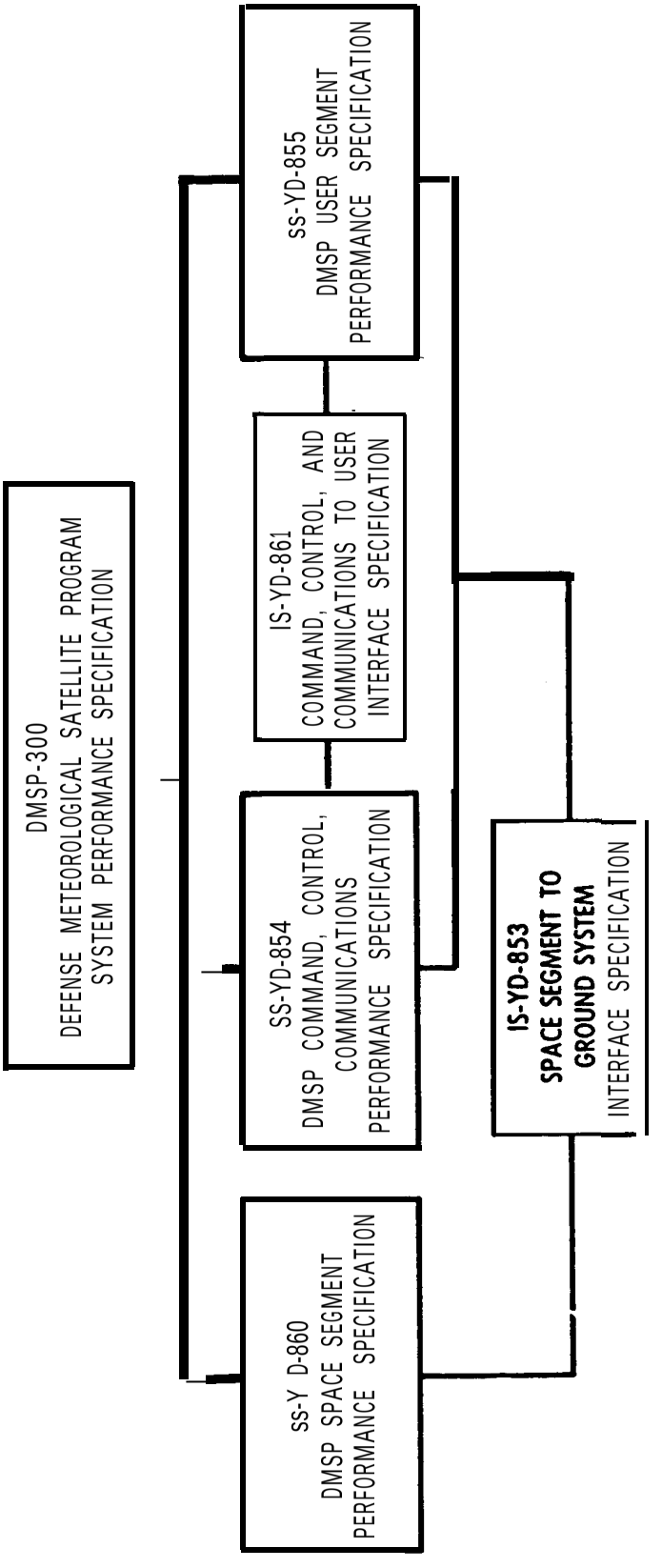


Figure 3.1-3. DMSP Specification Tree

3.1.5.2 C^3S-US Interface. This interface, described in IS-YD-861, encompasses the communications interface required to transfer the stored data from the C^3S to the AFGWC and FNOC through the US Sites 3 and 29, respectively. In addition, the C^3S provides ephemeris data to the AFGWC and FNOC, embedded in the stored data stream, in support of their mission planning and data processing activities.

3.1.6 Government Furnished Property List. Government furnished property shall be listed in the applicable segment specifications.

3.1.7 Operational and Organizational Concepts. The primary and other missions of the DMSP are described in paragraph 3.1.2. The priorities applicable to the mission sensors are specified in DMSS-100 in accordance with the requirements of the various users.

Sufficient satellites will be produced, checked out, launched, and inserted in the appropriate mission orbits to satisfy the DOD users' requirements as specified in this specification and in the SRD. This involves the procurement, checkout, and integration of a spacecraft bus, appropriate sensor complements to satisfy the data requirements specified in DMSS-100, and a launch vehicle system.

Similarly, the C^3S will be produced and checked out to perform the command and control functions, which will enable collection of the required data by the SS and their transmission to the User Segment in a timely manner.

The US will be produced and checked out to convert the raw mission data received from the satellites into the products required by the user community.

The Deputy for Defense Meteorological Satellite Systems in the Air Force Space Division is the DOD Executive Manager for the DMSP.

3.1.7.1 Concert of Operation.

3.1.7.1.1 Prelaunch Ooerations. System-level operations are initiated after each system segment has successfully completed its integrated segment test. The resulting system integration tests will consist of real-time integration tests between the Space Segment, located at the factory or at a launch base Assembly and Checkout Area (ACA), and the Command, Control and Communications Segment. The primary purpose of these tests is to verify that the satellite portion of the Space Segment can receive and properly execute all types of commands and computer memory uploads transmitted by the **C3S,** and **that the C3S** can receive the real-time status telemetry as well as stored sensor data and status TM transmitted by the satellite. Integration of the User Segment is verified by transmittal of the stored data to the AFGWC in real-time or by playback of a stored data tape from the **C3S** to both the AFGWC and FNOC, and by playback of RT mission data tapes into each of the tactical terminal types within the US. A Payload Test Facility (PTF) at VAFB will have the capability of processing and displaying RT and stored mission data as well as RT and stored status TM. It will support all system integration tests involving the space segment at the launch base.

The real-time portion of these system integration tests will be covered by a Command System Test (CST), conducted with the satellite at the factory or at the launch base, and by an Operational Command Test (OCT) which is conducted at the end of prelaunch preparation tests at the ACA. The CST will be conducted using landlines between the SS and **C3S** for RT transmission of status TM and **uplink** data, and recording RT and stored mission data--the latter including stored TM--for playback to the US. The AFSCN portion of the OCT will be conducted using RF transmission to and from the satellite and using the same communication links **as used** during orbital operations, to the greatest extent **practical.** | 004

3.1.7.1.2 Launch and Ascent Ooerations. Each satellite will be launched by the launch vehicle into a transfer orbit from which it will be injected into the specified mission orbit in an autonomous manner by an integral or separable propulsion subsystem.

3.1.7.1.3 Orbital Operations. After insertion of the satellite into its mission orbit, an early orbit (EO) check-out will be conducted, using the C^3S, to confirm proper activation and operation of the sensor payload and all satellite subsystems. Upon completion of the EO phase, the satellite will be committed for operational support. The entire sensor complement will collect and record sensor data and status TM on a continuous basis, transmitting this stored data on command during earth receiving station passes, while maintaining satellite attitude and solar array orientation within specifications. Requirements for collection and readout of stored data, and transmission of RT mission data, will be coordinated by the User Segment. They will be transmitted to the C^3S and translated there into RT and stored command table sequences to be uplinked to the satellite. The C^3S also performs state-of-health monitoring of the satellite, using for this purpose RT and stored status telemetry data, and generates RT and stored program command sequences and computer memory uploads to maintain optimum state-of-health and to control the satellite's configuration for the satisfaction of mission requirements.

The User Segment produces cloud cover imagery in the form of positive transparencies which, along with the other stored data, are used by AFGWC to generate forecasts of weather, specialized meteorological, oceanographic and ionospheric conditions. Products will be generated in a timely manner in accordance with user requirements. The AFGWC will operate in a similar manner on the data acquired from the NOAA polar and geosynchronous environmental satellites.

The User Segment Tactical Terminals (TT) will process DMSP mission data to produce cloud cover imagery in the form of positive transparencies. Future capability to expand data processing to include mission sensor data will be a primary design consideration. In addition, the TT will acquire cloud cover imagery from NOAA polar satellites, and weather facsimile data from the NOAA and foreign geosynchronous environmental satellites Data analysis is performed and forecasts are generated for distribution to the local area users. Certain TT elements will have the capability of relaying processed imagery data to remote users.

3.1.7.2.4 Air Force Global Weather Central. Although not part of DMSP, the AFGWC is responsible to the Comnander, Air Weather Service (AWS), for operating the Data Reconstruction Site (DRS) at Offutt AFB to process and display stored mission data, and for generating and disseminating data products in conformance with AWS user requirements. Processing by the DRS, which is part of the US, includes relay to the C^3S Satellite Operations Center of the stored mission data stream containing status telemetry. The AFGWC also specifies to the 1000th SOG, by means of a Payload Activation Message (PAM), the US requirements for mission data readin (WI) and readout (R/O) by the onboard tape recorders, and the US needs for broadcast of real-time mission data (RTD) by the satellite.

3.1.7.2.5 Fieet Numerical Oceanography Center. Although not part of DMSP, the FNOC has a strong interface with DMSP that, to a major extent, mirrors the AFGWC DMSP operations. The FNOC is responsible to the Commander, Naval Oceanography Command, (CNOC), for operating the Satellite Processing Center (SPC) at Monterey CA, to process and display stored mission data, and for generating and disseminating data products in conformance with Navy user requirements. The FNOC and other Navy users specify to the AFGWC, for inclusion in the PAM, their respective requirements for mission data R/I and R/O and for RTD transmissions by the satellite.

3.1.7.2.6 Operational Requirements Group. In accordance with the joint-service Memorandum of Agreement (MOA), the ORG is composed of the three service segments of DMSP (Air Force, Army, and Navy including Marine Corps) and constituted at the AFGWC. The ORG is responsible for reviewing the operational performance of the satellites and periodically advising the DoD Executive Manager for DMSP and the Services of their findings. It will also collect and prioritize, in accordance with agreed-upon guidelines, the direct data requirements and recommend to the Commander, AFGWC, allocation of direct data coverage. In addition, consistent with the operational mission, it will collect and prioritize requests for data coverage to support research and development (R&D) effort of the Services, and recommend allocation of direct coverage to the AFGWC commander.

3.1.7.2.7 **Western Space and** Missile Center **(WSMC).** Responsible to the Commander, SD, for the provision of facilities and services to support prelaunch activities and launch of DMSP space vehicles from Vandenberg Air Force Base (VAFB).

3.1.7.2.7.1 6595th Satellite Test **Gup** '6595 **STESTG).** Responsible as representative, at VAFB, of **SD/YD** for all DMSP operations, and of **SD/YX** for all Launch Vehicle Operations.

3.1.7.2.8 Air **Force** Satellite Control **Network.** The AFSCN is responsible to **SSD/MW** for supporting **the 1000th** SOG during prelaunch, ascent and normal operations of the DMSP satellites, and for providing an interface between the MPSOC and **FSOC** and the AFSCN RTS tracking network. In addition, it will provide, through its Hawaii Tracking Station (HTS), Thule Tracking Station (TTS), and New Hampshire Tracking Station (MIS), the capability of command **uplink** from **FSOC** and MPSOC and the relay of spacecraft telemetry and mission data to MPSOC, **FSOC,AFGWC** and FNOC. 004 003 004

3.1.7.2.9 **The Aerospace Corporation.** Responsible to **SD/YD** and **SD/YX,** respectively, for General Systems Engineering and Integration **(GSE&I)** for the DMSP and the Medium Launch Vehicle Programs.

3.2 CHARACTERISTICS

3.2.1 System Performance Characteristics. The performance characteristics specified for the DMSP shall be based on the current Program Management Directive PMD R-S 3015/PE35160F, as reflected by approved and funded elements.

The fundamental system requirement shall be to collect the following data for onboard storage and subsequent relay to user agencies:

a. Visible and infrared (IR) cloud cover imagery.

1. Regional scale data with cross-track and in-track resolution of 0.3 nmi, storable onboard in increments of up to 20 minutes of interleaved light fine (LF) and thermal fine (TF) data per orbit revolution (rev), or up to 40 minutes of LF or TF for readout to the ground (Stored Data Fine-SDF).

2. Continuous global scale data with cross-track and i-track resolution of 1.5 nmi, storable onboard interleaved with data described in b & c below, in increments of up to 4 revs (Stored Data Smooth-SDS).

b. Continous meteorological, oceanographic, and solar-geophysical data on a global scale, as specified in the SRD, storable onboard as part of SDS data in increments of up to 4 revs.

c. Continuous status telemetry, which is stored onboard as part of SDS data in increments of up to 4 revs.

The imagery data from the primary sensor, which must reflect contiguous coverage at the equator for consecutive orbit revolutions (revs), and other meteorological, oceanographic, and solar-geophysical data from the mission sensors shall be processed by Site 3 for display and analysis at AFGWC in support of user mission requirements.

An additional requirement is the transmission of real-time data to User Segment Tactical Terminals. The real-time data shall be interleaved fine data and smooth data streams, one of which contains visible light (L) data while the other contains IR or thermal (T) data.

Wore detailed requirements for mission data acquisition are contained in DMSS-100.

Launch and insertion **of** DMSP satellites into the mission orbit, and their maintenance in an operational condition to permit collection and transmission of the above-described data for the life of the satellite specified in 3.2.3, are also included in the system requirements.

3.2.1.1 **Inter-Segment** Performance Characteristics. Allocation of the system requirements to each of the system segments shall be consistent with the guidelines contained in Figure 3.2-l.

3.2.1.1.1 Launch and Ascent **Requirements.** The DMSP satellites through Flight 11 shall be launched from the Western Space and Missile Center (WSMC) by an Atlas-E EXPENDABLE **LAUNCH** VEHICLE (ELV) into a transfer orbit whose apogee is at mission orbit altitude. The ELV for subsequent satellites , through S17 is the Titan II ELV. The ELV for S18 and beyond is TBD. The trajectory flown by the ELV shall satisfy the transfer orbit injection requirements for the maximum projected satellite weight, taking into consideration ascent thermal constraints, and mission orbit orientation and allowable drift characteristics. 004

The time and extent of the launch window are determined by the ascending node time and the allowable tolerance specified for each satellite.

After separation from the launch vehicle, the satellite shall be propelled into the mission orbit, specified in 3.2.1.1.2, by an integral or separable propulsion subsystem operating in an autonomous mode. The performance characteristics of the SS shall be compatible with the LV mechanically, electrically, and in terms of all data interfaces required for prelaunch, launch and ascent operations.

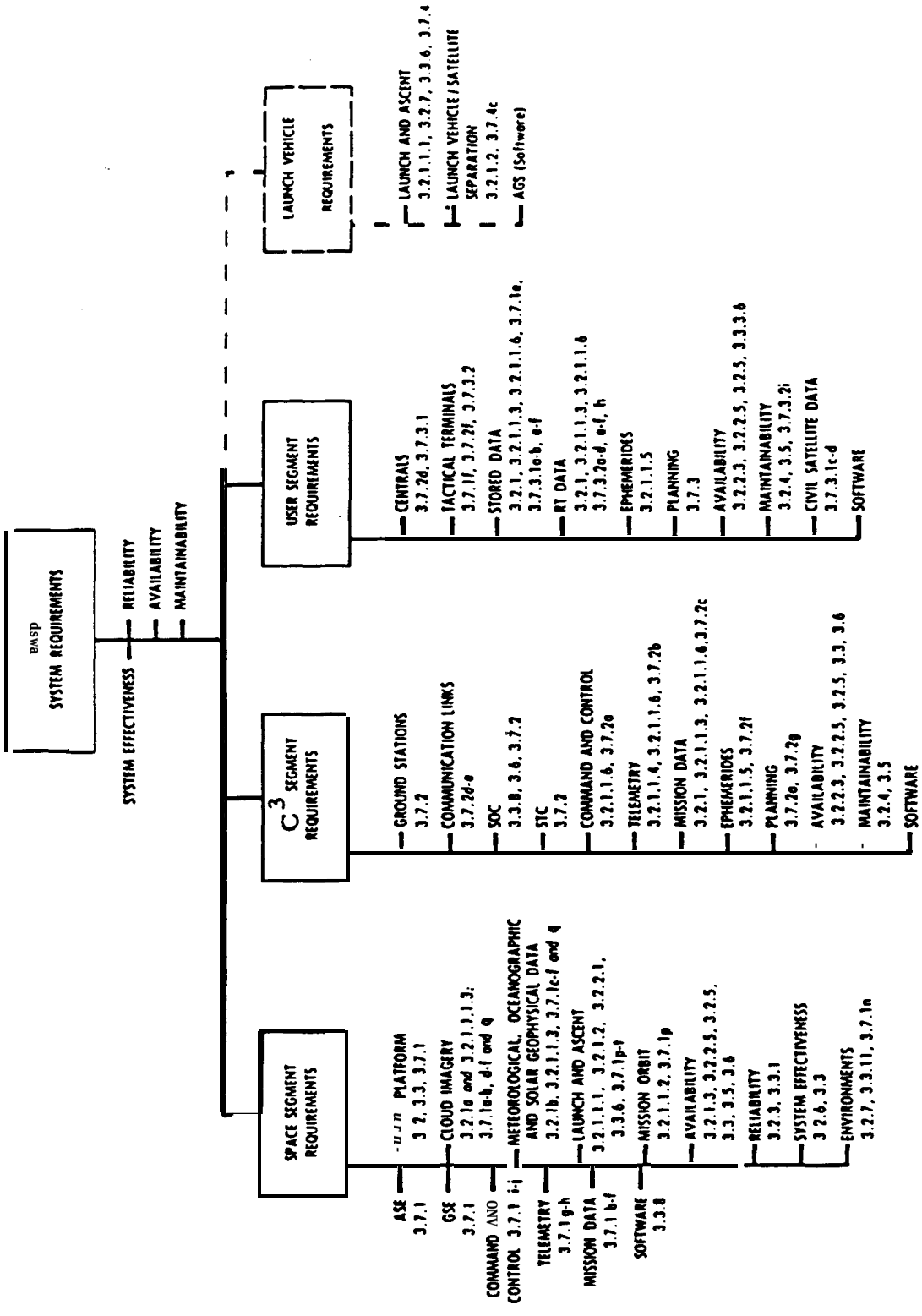


Figure 3.2-1 System Requirements Allocation

3.2.1.1.2 Mission Orbit. The satellite shall operate in a nominally circular, sun-synchronous orbit with apogee and perigee altitude above the equator constrained to fall within the region shown in Figure 3.2-2, based on contiguous earth coverage at the equator by the primary sensor with a minimum non-vignetted scan angle of 55.35°.

The satellites shall be capable of operating in such an orbit with any ascending node crossing time selected to satisfy user requirements.

Drift in nodal crossing time over the life of the satellite shall be less than TBD.

3.2.1.1.3 Mission Data. The satellite sensor complement shall acquire, store, and transmit data necessary to satisfy the requirements for the generation of data products by the US in accordance with the qualitative and quantitative criteria specified in DMSS-100.

The User Segment shall operate on the real-time and stored mission data formats at all applicable data rates. Each component of the US shall record all ingested sensor data for off-line analysis to support the generation of data products specified by the users, and selectively retain data for support of engineering and anomaly analyses.

3.2.1.1.4 State-of-Health Data. The satellite shall generate a continuous stream of RT satellite status data to enable the exercise of command and control by the C^3S. This data shall be stored onboard continually except when status telemetry is transmitted at 10 or 60 kb/s.

The C^3S shall acquire the satellite status telemetry for the duration of all ground station passes, and perform on-line processing necessary for the assessment of satellite performance and the exercise of command and control. The C^3S shall also acquire all stored telemetry in proper time sequence for the purpose of performing trend and anomaly analyses.

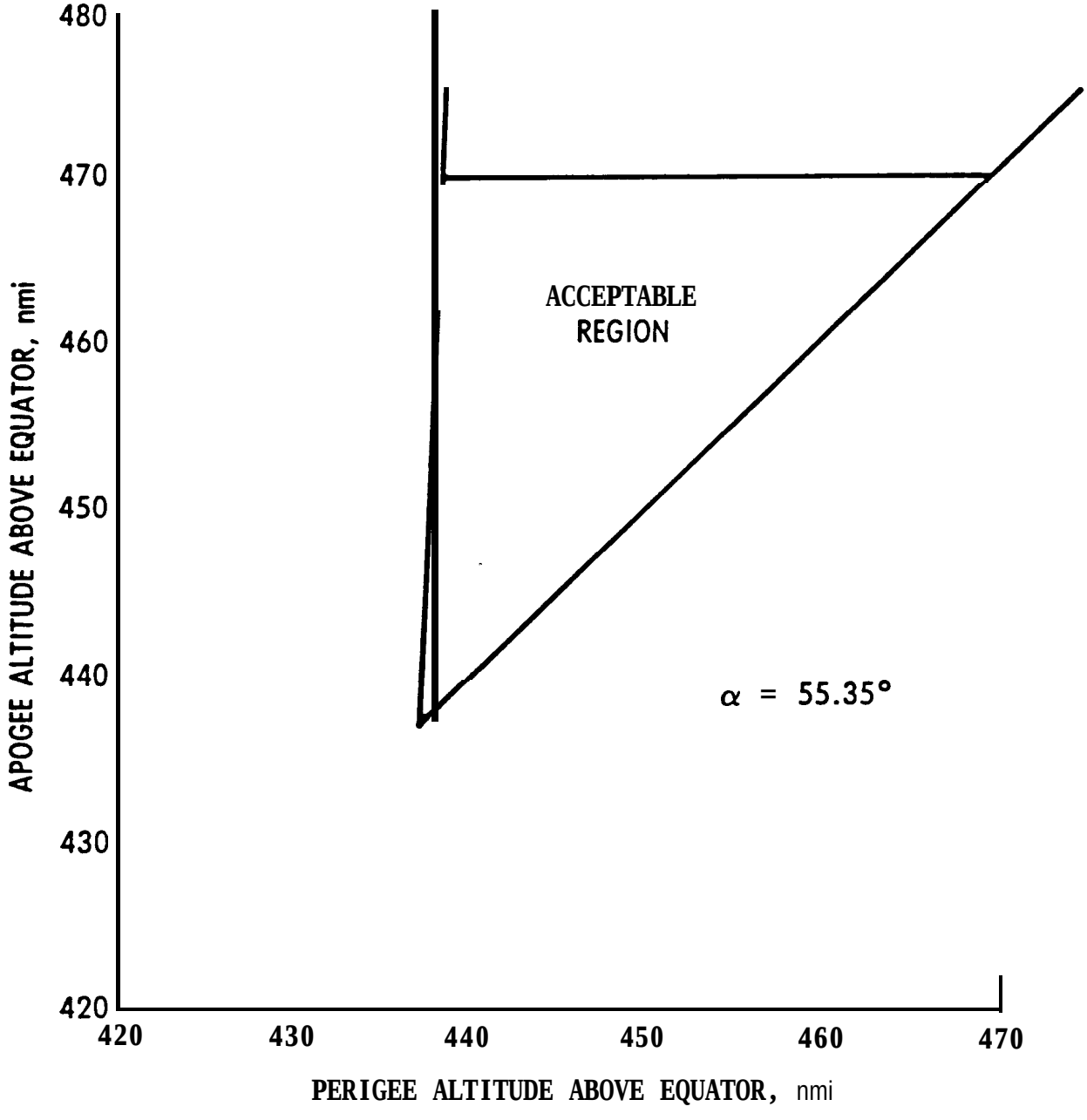


Figure 3.2-2. **Mission Orbit Constraints**

3.2.1.1.5 Orbit Ephemeris Date The C3S shall generate vectors or orbital element sets representing the orbit of each DMSP satellite at periodic intervals and deliver same to the appropriate elements of the C3S itself and to the US. The frequency of generation and transmittal shall be such as to satisfy the respective elements' requirements for mission planning and execution, the exercise of command and control including the maintenance of satellite pointing accuracy, and the location correlation of mission data.

3.2.1.1.6 Telecommunication Requirements. The command uplink and status telemetry downlink shall be encrypted and fully compatible with the Space Ground Link System (SGLS) Carrier 1 specifications per TOR 0059(6110-01)-3. Three mission data downlinks shall be provided which are encrypted and compatible with the SGLS Carrier 2 specifications, except that they shall be able to handle bit rates up to 2.6624 Mb/s. For redundancy purposes, all satellite downlinks shall be able to handle the maximum bit rate indicated.

3.2.1.1.6.1 Data Handling. The C3S and SS shall, respectively, generate and operate on encrypted and authenticated command sequences and on non-authenticated encrypted uploads at serial bit rates of 2 kb/s (through S-15) and 10 kb/s (S-16 through S-20). The correspondingdata word rate, at a minimum, shall allow an upload and a verification download of the spacecraft processor (S-16 through S-20) in one ten minute station circle. The satellite shall be capable of transmitting encrypted telemetry rates of 2, 10, and 60 kb/s, RT encrypted mission data at 1.024 Mb/s, and encrypted stored mission and status telemetry data at 1.3312 and 2.6624 Mb/s. 004

The satellite shall have data storage devices with the capability of storing up to 400 minutes of LS and TS data, and either 20 minutes of LF and TF data or 40 minutes of LF or TF data. It shall be able to read out the SDS and SDF data as described above during one ground station contact of at least 10 minutes.

The Space Segment production/launch facilities and the C3 Segment CRS's shall have the capability to record, store, and interchange mission and state of health data. 002

3.2.1.2 Dynamic Performance.

3.2.1.2.1 Ascent Control. ELV guidance shall be provided from lift-off until engine cutoff. Satellite inertial references shall be initialized prior to launch and shall support 3-axis stabilized attitude control following separation from the ELV, and during ELV powered flight, if called for.

Upon separation from the ELV, satellite attitude shall come under control of an Ascent Guidance Software (AGS) package in the spacecraft computer which shall orient the satellite for delta-V initiation and provide steering during the delta-V maneuver and any subsequent velocity trim maneuver into the final mission orbit. The satellite shall be able to compensate for LV injection errors of up to ±3 sigma.

After completion of the orbit injection, the AGS shall cause the spacecraft to be configured to its on-orbit operational configuration, transfer control to the Orbit Mode Software (OMS) at handover, and configure for first station acquisition.

3.2.1.3 Endurance. The on-orbit design life of the satellite following orbit injection shall be 3 years, with a goal of 4 years. The design of the satellite shall be such that satellite storage before launch, under controlled conditions, may be planned for up to two years. The total design service life of the satellite shall be no less than 5.5 years, including the storage time (2 years), prelaunch checkout time (45 days), launch and injection time, mission orbit time, and contingency time. The payload is assumed inactive during all phases except on-orbit and test times.

3.2.2 Physical Characteristics.

3.2.2.1 Mass Properties. The mass properties of the space elements shall be designed to conform to performance, stability, and control requirements of the LV and SS.

The weight of the space elements shall be controlled for the preservation of performance margins and as a control of other mass properties.

The lift-off weight of the satellite and its ASE shall be consistent with the payload lifting capabilities of the launch vehicle specified.

The mass properties of ground elements of the system shall be consistent with their intended application. The center of gravity of ground equipment shall be such that probable seismic activity will not cause the equipment to upset. The weight of ground elements shall be controlled to avoid excessive floor loading for fixed equipment and excessive road loading for mobile equipment. The weight of all equipment shall allow transportability by truck and MAC aircraft.

3.2.2.2 Dimensions. The dimensional envelope constraints shall be based upon the combination of dynamic and thermal envelopes encountered during factory assembly, system test, transportation, launch, deployment, and other phases of operations. Dimensional envelope constraints on the space segment relative to the LV shall be as specified in GDC/LVP 80-034 or in interface documents pertaining to an alternative LV. Other dimensional constraints within the space segment include placement of sensor payloads to preclude operational interference by the spacecraft or by other sensor payloads.

3.2.2.2.1 Coordinate System. The coordinate systems applicable to command and control of the space segment and to acquisition and processing of the mission data by the other segments, as applicable, shall be based on an earth-centered inertial (ECI) coordinate system defined as follows:

- $-Y_I$: Pole of the true equator of date earth polar axis
- $-Z_I$: Vector in the plane of the true equator of date in the direction of the mean equinox of date.
- $-X_I$: Vector in the plane of the true equator of date which completes a right-hand triad

3.2.2.2.1.1 ELV Coordinate System. The ELV coordinate system and relations between the ELV, ELV/spacecraf t adapter, and the spacecraft coordinate systems shall be as specified in GDC/LVP 80-034, or an alternative LV interface document.

3.2.2.3 Power. The primary electrical power generation and storage subsystem in the SS shall provide sufficient power to fully perform the specified mission under all conditions of solar illumination and eclipse, in a near autonomous manner with a minimum of power management control by the C^3S.

The primary electrical power supplied to the ground based elements shall be backed up by sufficient automatically switched power reserves to enable continued normal operation of the system during short (TBD) interruptions of the primary power. Emergency power provisions shall be made to ensure safing of the satellite and orderly shutdown of the critical ground based elements.

3.2.2.4 Durability. (TBS)

3.2.2.5 Survivability. (TBS)

3.2.3 Reliability. The reliability allocations shall ensure that the overall mission reliability requirements are met under the worst case conditions of storage, transportation, testing and operations.

Reliability predictions and standby failure rates shall be in accordance with MIL-STD-1543 and shall use part failure rates as specified in Section 5.1 of MIL-HDBK-217.

3.2.3.1 Reliability for Initial On-Orbit Operation. The space segment shall be designed to perform the required functions during--and to withstand the effects of--pre-launch, launch, ascent, separation from the ELV, earth orientation, transfer orbit coast, mission orbit insertion, and operations through the first primary data acquisition with a probability of success (P_s) of 0.95. The reliability factor applicable to launch, ascent, and satellite separation operations of the ELV shall be 0.90, and is not included in the above P_s of 0.95. Reliability of the C^3S and US shall be assumed as 1.0 for this time interval.

3.2.2.3 Power. The primary electrical power generation and storage subsystem in the SS shall provide sufficient power to fully perform the specified mission under all conditions of solar illumination and eclipse, in a near autonomous manner with a minimum of power management control by the C^3S.

The primary electrical power supplied to the ground based elements shall be backed up by sufficient automatically switched power reserves to enable continued normal operation of the system during short (TBD) interruptions of the primary power. Emergency power provisions shall be made to ensure safing of the satellite and orderly shutdown of the critical ground based elements.

3.2.2.4 Durability. (TBS)

3.2.2.5 Survivability. Survivability enhancements for the Command, Control, and Communication Segment shall be specified in SS-YD-854. 001

3.2.3 Reliability. The reliability allocations shall ensure that the overall mission reliability requirements are met under the worst case conditions of storage, transportation, testing and operations.

Reliability predictions and standby failure rates shall be in accordance with MIL-STD-1543 and shall use part failure rates as specified in Section 5.1 of MIL-HDBK-217.

3.2.3.1 Reliability for Initial On-Orbit Operation. The space segment shall be designed to perform the required functions during--and to withstand the effects of--pre-launch, launch, ascent, separation from the ELV, earth orientation, transfer orbit coast, mission orbit insertion, and operations through the first primary data acquisition with a probability of success (P_s) of 0.95. The reliability factor applicable to launch, ascent, and satellite separation operations of the ELV shall be 0.90, and is not included in the above P_s of 0.95. Reliability of the C^3S and US shall be assumed as 1.0 for this time interval.

3.2.3.2 Satellite On-Orbit Reliability. The follow-on satellites shall be designed for their primary missions, defined in 3.1.7, to have a minimum on-orbit Mean Mission Duration (MMD) of 33 months-with a goal of 40 months. Criteria for previous 5D-2 satellites are contained in lower tier documentation. MMD is defined by the following equation for a reliability function Re(t) and for a time interval t from zero to the end of mission life T_L:

$$MMD = \int_{D}^{T_L} Re(t)\, dt$$

Values of T_L corresponding to MMDs of 33 and 40 months are 36 and 48 months, respectively. The minimum acceptable on-orbit probability of success for the primary satellite mission, i.e., acquisition of good quality imagery, shall be 0.64 for a 36-month mission.

3.2.3.3 C^3S and US. The ground-based elements shall be designed for a useful operating life of 10 years from functional acceptance at the operational site.

3.2.3.4 Single-Point Failures. All single-point failures, identified by a Failure Modes and Effects Criticality Analysis (FMECA), shall be eliminated, where practical, if they can cause critical or catastrophic degradation in the operational performance of the system.

3.2.3.5 Redundancy. Redundancy shall be provided, to the extent practical, to eliminate single-point failures which have a critical or catastrophic impact on the DMSP mission, and to ensure that the MMD requirement specified in 3.2.3.2 is satisfied.

3.2.4 **Maintainability.** The spaceborne elements of the system shall be designed so as not to require any scheduled maintenance or repair during their service life. Where practical, their design shall incorporate test and telemetry points to allow verification of functional performance, and shall accommodate easy installation and replacement of major subassemblies.

Design of the ground-based elements Shall provide for modular construction, for ease of maintenance and for the attainment of the equipment availability needed to support the specified service life and mission reliability. The design shall also provide for self test features.

3.2.4.1. **Design for Maintainability.** The design shall be based on the principle that component failures during ground tests, checkout, and storage can be repaired without degrading the performance or reliability characteristics of other components.

3.2.5. Availability. The overall availability of the system shall not be less than 0.78. The following assumptions and conditions apply to this factor and to the segment availability values tabulated below, as appropriate.

1. The availability of the space segment is predicated on the assumption that the satellite has been launched and successfully checked out in early orbit operations.

2. A single satellite requirement is the reference state for the tabulated Space Segment availability. In order to obtain the SS availability for the case when more than one satellite is required to fulfill system requirements, the availability for a single satellite requirement is raised to the power of the number of required satellites.

3. The availability of the C3S is based on the assumption of two satellite operations centers (MPSOC and FSOC), multiple tracking station locations (FSOC, AFSCN RTS/ARTS), and redundant communication links required to support their functions. 004

4. A single terminal requirement is the reference state for the tabulated US real-time terminal availability. In order to obtain the availability for the case where a group of such terminals is required to satisfy system requirements, the binomial formula shall be used for its computation.

5. US availability is based on the requirement for simultaneous support from the AFGWC and FNOC.

6. Adequate resources are available for acquiring and maintaining reliability, redundancy, maintainability and spares.

Segment	Availability
SS	0.91*
C^3S	0.94
US (Tactical Terminal)	0.98
US (Stored Data)	0.96

*Excludes launch vehicle considerations

3.2.5.1 Launch Availability. The space segment shall remain in a readiness condition following integration and system performance verification so that it will be available for launch 60 days after call-up. Availability of the LV shall be consistent with the above schedule requirements.

3.2.5.2 On-Orbit Availability. The space segment shall be available for primary sensor data acquisition and transmission operations 100% of the total time of the specified design life subsequent to achieving an initial operational capability (IOC). The availability for mission sensor operations other than OLS subsequent to the IDC shall be 90% of the total time of the specified design life.

3.2.6 System Effectiveness Models. System effectiveness models to support reliability analyses shall be based on MIL-STD-756.

3.3 DESIGN AND CONSTRUCTION.

3.3.1 Parts; Materials, and Processes. Unless otherwise specified, the parts, materials, and processes (PMP) for the DMSP shall be selected and controlled in accordance with contractor-established and -documented procedures to satisfy the requirements specified herein.

An additional objective in the selection of parts, materials, and processes shall be to maximize commonality and thereby minimize the variety of parts, related tools, and test equipment required in the fabrication, installation, and maintenance of the system. However, identical electrical connectors, fittings, or other identical parts shall not be used where inadvertent interchange of items or interconnections could cause a malfunction.

3.3.1.1 Structural Materials. Materials shall be corrosion resistant or shall be suitably treated to resist corrosion when subjected to the environments specified in 3.2.7.

3.3.1.2 Finishes. The finishes used on the system CIs and their components shall be such that the completed items shall be resistant to corrosion. The design goal shall be that there be no destructive corrosion of the completed system equipment when exposed to moderately corrosive environments such as industrial environments or exposure to sea coast fog. Destructive corrosion shall be construed as being any type of corrosion which interferes with meeting the specified performance of the device or its associated parts.

3.3.1.3 Material Selection. Materials shall be selected that have demonstrated their suitability for the intended application. Where practical, fungus inert materials shall be used. Use of combustible materials shall be kept to an absolute minimum, with particular emphasis on those which generate toxic products of combustion.

3.3.2 Electromagnetic Compatibility. The system shall be designed such that it is compatible with itself, with its known environment, with test equipment, Ground Support Equipment and with Government Furnished Equipment. The electromagnetic compatibility (EMC) requirements shall be in accordance with MIL-STD-1541. All support facilities, including test facilities and launch base facilities, shall comply with the grounding requirements of MIL-STD-1542.

3.3.2.1 TEMPEST. Integration of COMSEC devices into the system, as specified in 3.7 and the respective segment specifications, requires careful isolation of Plain Text (PT or red) data from encrypted or Cipher Text (CT or black) data. The system shall comply with the conducted and radiated interference susceptibility requirements of NACSEM 5100 and the applicable TEMPEST sections of NSA-CSESO-l,-7,-8,.10, and -17. MIL-STD-1541 and NACSEM 5109 will be used where applicable.

The COMSEC GFE will comply with all applicable sections of NACSEM 5100 and will meet the TEMPEST requirements above.

Compliance with these TEMPEST requirements shall be verified by test. Analysis may be substituted for test in those cases where testing is not feasible or practical.

3.3.3 Nameplates and Product Marking. System components and equipments shall be identified in accordance with MIL-STD-130. The system CIs and each interchangeable subassembly shall be identified by a nameplate.

3.3.4 Workmanship. Equipment shall be manufactured, processed, tested, and handled such that the finished items are of sufficient quality to ensure reliable operation, safety, and service life. The items shall be free of defects that would interfere with operational use such as excessive scratches, nicks, burrs, loose materials, contamination, and corrosion.

3.3.5 Interchangeability. To the extent practical, the design of all system equipment shall make provisions for modular replacement of components to expedite maintenance and repair. The design of the space elements shall make provisions for the factory replacement of components and subassemblies and for the prelaunch installation or replacement of explosive ordnance devices, batteries, and major space segment components. Components and piece parts of the same part number shall be readily replaceable and/or interchangeable with regard to form, fit, and function.

3.3.6 Safety. The system design shall be such that a safety hazard to personnel and surrounding equipment shall not be created during installation, maintenance, ground test, transportation, and operational use. Safety procedures shall be documented and implemented to ensure maximum freedom from accidents attributable to facilities, equipment, and personnel. The safety requirements shall be formulated to achieve an integrated system safety engineering effort. Procedures shall be used and precautions taken to preclude the dropping of tools or other items that might injure personnel or damage sensitive equipment during installation, maintenance, ground test, and transportation. The safety requirements and procedures shall comply with applicable Range Safety manuals.

3.3.7 Human Performance/Human Engineering. The design of the system shall include consideration of applicable Human Performance/Human Engineering requirements as defined in MIL-SlD-1472.

3.3.8 Computer Resources. Computer resources include all computer programs and the associated computational equipment included within the system. Computational equipment includes both the equipment which executes symbolically expressed instructions and the associated peripheral devices. These computer resources shall be designed and developed in accordance with an integrated plan that minimizes the system life cycle cost. The system design shall provide ample memory and processing margins to accommodate contingencies and growth. Computer resources in this system are grouped and identified as those which functionally support operations, those used for computer program

maintenance, those embedded in test equipment, and those included in other functional areas such as simulators.

3.3.8.1 Operational Computer Resources. The operational computer resources are those required to function on-line or off-line during one or more phases or modes of the operational service life. The operational computer resources shall be capable of performing the required real-time computational functions in the satellite, in the launch vehicle, and in the ground equipment. These real time functions include data processing, communications, display, and control functions. In addition, the operational computer resources shall perform the required non-real-t ime data processing and support functions.

3.3.8.1.1 Operational Computational Equipment. The computational equipment includes processing units; special purpose computational devices; main storage; peripheral data storage; input and output units such as modems, and printers, graphic displays, and video display devices; and other associated devices. To the extent practical, the ground operational computational capability shall be provided by commercially available general purpose computer equipment.

The computer instruction performance rate and data channel capacity shall have a minimum of 50% spare capacity relative to that required by the worst case operational data rate projected at the time of the Critical Design Review (CDR).

3.3.8.1.1.1 Data Storage. The main storage (primary memory) and the peripheral data storage (secondary memory) in operational ground computers shall be modular in design, and shall have at least 50% spare capacity over that projected to satisfy all system requirements at the time of the CDR.

The primary and secondary memories in the SS shall have at least 50% spare capacity relative to the utilization projected to satisfy system requirements at the time of the CDR.

3.3.8.1.2 Operating Systems in Operational Computers. The operating system for each operational computer should be in broad use and should have a demonstrable record of reliable performance. Operating systems which require development shall be designed in accordance with the standards, conventions, and development requirements for operational application programs contained herein,

3.3.8.1.3 Operational Application Programs.

3.3.8.1.3.1 Programming Language. Where practical, operational application computer programs shall be written in one of the DOD-approved programming languages, as listed in 6.5. Assembly language shall be used only where its use is necessary for the satisfaction of system performance requirements or where its use is cost effective over the life of the system. The term "assembly language" includes the use of microcode and microprogramming.

3.3.8.1.3.2 Computer Program Structure. The computer program structure shall consist of Computer Program Configuration Items (CPCIs), Computer Program Components (CPCs), and Computer Program Modules (CPMs).

a. Computer Program Configuration Item . The top level computer program end item is a CPCI. A CPCI consists of one or more subtier elements. The subtier elements of a CPCI may be other CPCIs, computer program components, or modules.

b. Computer Program Component. A CPC is an arbitrary subtier element of a CPCI which may be defined to assist in the development or acquisition process. A CPC consists of one or more subtier computer program modules.

c. Computer Proqram Module. A computer program module may provide information, or may provide a capability to perform one or more operations, or may provide both. A module may contain embedded

modules. Several different types of modules may be defined depending upon the computer language used.

3.3.8.1.3.3 Structure of Modules. Computer program modules shall each be organized into an interface section and an implementation section. The interface part shall characterize the capabilities the module makes available to other modules or to other interfacing system items such as devices or human operators. The implementation part of each module shall define how the operations specified in the interface are to be provided. Only standarized control structures which have closed structures shall be used in the module design.

3.3.8.1.3.4 Hierarchical Program Design. Operational computer programs shall be designed in a hierarchical manner, and the levels of the hierarchy shall correspond to the levels of abstraction of the tasks performed by the program.

Each level of the program shall be complete in itself. Provisions for incorporating existing modules into the hierarchy shall be made so as to maximize, where practical, the reuse of previously developed computer programs.

3.3.8.1.3.5 Program Comments. Comments shall be incorporated throughout the diagnostic version of each computer program to self-document the organization and logic of the program.

3.3.8.1.3.6 Message Generation. The ground operational computer programs shall generate error and diagnostic messages on-line to facilitate real-time fault isolation required to maintain the system in operational status. In addition, these ground operational computer programs shall generate off-line error and diagnostic messages for the logging of fault messages onto system files for those categories of faults which require isolation and correction but can be addressed off-line and do not degrade system performance.

With the exception of lengthy diagnostic procedures for use following an

abnormal condition, processor message and advisory formats shall not require additional interpretation by the operator. Furthermore, every message and advisory shall include a unique description of the condition which prompted it.

3.3.8.1.3.7 Character Set Standards. Character sets shall conform to standards in ANSI-STD X 3.4-1977.

3.3.8.1.3.8 Growth. The operational application computer programs shall satisfy their performance requirements without the implementation of any of the growth provisions identified herein for computational equipment. However, the application programs should be designed to be capable of easily exploiting any of the identified growth provisions, such as added memory, which may be implemented.

3.3.8.1.4 Operational Firmware. Computer programs and data stored in a class of storage that cannot be dynamically modified by the computer during processing shall be considered firmware. Requirements on operational firmware shall be the same as those on operational application computer programs.

3.3.8.1.5 Computer Resource Utilization Monitoring. The ground operational computer resources shall provide a capability which can be exercized under operator control to monitor, record, display, and print the utilization of the various computer resources.

3.3.8.2 Computer Program Maintenance Resources.

3.3.8.2.1 Equipment for Computer Program Maintenance. The computational equipment for computer program maintenance is that equipment required during the operational service life to develop and test changes to the computer programs used in operational equipment and in simulation equipment. To the extent practical, this equipment shall be identical to the computational equipment used for computer program development and shall be capable of accommodating the growth requirements of the operational computational equipment without necessitating any hardware modifications.

3.3.8.2.2 Programs for Computer Program Maintenance. The operating system for each computer used in the maintenance of operational computer programs shall be capable of exploiting the growth requirements specified for the operational computational equipment without necessitating any major modifications. Maintenance of operational computer programs shall be supported by utility programs and other computer programs running with the operating system(s) and computer(s) specifically identified for computer program maintenance.

To the extent practical, the operating system(s), other computer programs, and firmware to be used for computer program maintenance during the operational service life shall be the same as that used for computer program development.

3.3.8.2.3 Computer Resource Utilization Monitoring. The computer resources used for computer program maintenance shall provide a capability to monitor, record, display, and print the simulated utilization of the operational computer resources under simulated operational conditions.

3.3.8.2.4 Additional Growth Capability. The computer resources used for computer program maintenance shall be capable of accommodating the specified growth requirements of the operational computer resources without necessitating any major modifications.

3.3.8.2.5 Tools for Computer Program Maintenance. Tools required for the initial development of operational computer programs and firmware shall be organized into a library and facility for subsequent reuse in testing and validating charges to the computer programs.

3.3.8.3 Computer Resources in Test Equipment. Test equipment is that equipment required to support the maintenance, repair, and checkout of the system hardware following system deployment. The computer resources that are embedded in the test equipment shall meet the requirements specified for operational computer resources except for programming language requirements

and for growth potential. Computer programs for use in automatic test equipment shall be written in ATLAS per ANSI/IEEE 416-1978, where practical.

3.3.8.4 Computer Resources in Simulator. The simulators are the equipment to be used for the simulation of the space segment as it interfaces with its own and the ground segment computers, for verification of computer program changes and their effect on the interfaces, and for training of system operations personnel. The computer resources in the simulators are the computer programs and the associated computational equipment, controls, and displays embedded in them. To the extent practical, the computational equipment in the simulators which provides operator displays and controls shall be identical to the corresponding operational computational equipments. The simulators shall be capable of accommodating the growth requirements of the operational equipment without requiring major modifications.

3.3.9 Reserved.

3.3.10 General Construction Requirements.

3.3.10.1 Processes and Controls. The manufacturing of the system equipment shall be accomplished in accordance with procedures and process controls which assure reliability and quality required for the mission.

3.4 DOCUMENTATION.

Documentation may follow the contractor's established operating practices except as modified by the Statement of Work (SOW) and the Contract Data Requirements List (CDRL). Only documentation listed in the CD5 will be formally delivered for review or approval.

The final system documentation will be such that subsequent production items produced or procured by the contractor are functionally and dimensionally equivalent in all respects to those initially tested or delivered. This final documentation will also be adequate to allow the rapid incorporation of changes and modifications by the contractor or user where necessary or desired.

Contingency procedures are to be included in the documented operational procedures in order to minimize the impact of possible anomalies to the greatest extent practical.

3.5 LOGISTICS.

Equipment designs shall be based upon minimizing the system life cycle cost with the contractor(s) providing the logistic support for the Space Segment; for the other segments, provision of logistic support is at the government's option. Emphasis shall be placed on the remove/repair/replace concept to minimize spares requirements. Spare parts and maintenance support shall be as specified in 3.5.2.

3.5.1 Maintenance and Repair. Only remove and replace maintenance and remove and replace repair actions shall be performed on the satellite and ASE after shipment to the launch base. Where practical, remove-and-replace maintenance and repair actions shall apply to all ground system elements. Repaired components, which are to be installed in any segment or lower level CIs, shall meet the performance and reliability requirements established for acceptance of newly fabricated articles.

3.5.2 Supply. Spare parts and maintenance support shall comply with MIL-STD-1538 in respect to the Space Segment, and with System Concepts and Procedures (SCAP), Vol.I-V, in respect to the C^3S and US.

3.6 PERSONNEL AND TRAINING.

Wherever practical, system design shall minimize the need for personnel interaction with each of the system segments, particularly during real-time operations. Detail requirements for personnel and training shall be specified in the respective segment performance specifications.

3.7 FUNCTIONAL AREA CHARACTERISTICS.

3.7.1 Space Segment. The space segment shall provide global and regional cloud cover imagery, and other specialized meteorological, solar-geophysical and oceanographic data for the MMD specified in 3.2.3.2. It shall be subject to command and control by the C^3S, shall be capable of transmitting status telemetry and mission data in real time, and store same onboard for subsequent readout to the C^3S. The space segment shall have autonomy to the greatest practical extent in the maintenance of its attitude, and of adequate electrical power and thermal balance to execute all mission requirements both in daylight and in eclipse conditions. The space segment design shall ensure that sufficient redundancy exists for recovery from single failures, and that in the event of unstable satellite attitude the C^3S ground stations will be able to exercise command and control to initiate recovery.

The Space Segment shall include Airborne Support Equipment and Ground Support Equipment. The ASE shall provide the mechanical, electrical, and signal handling equipment interfacing with the LV which will be required for prelaunch and ascent operations, and shall remain with the LV on separation of the satellite. The GSE shall include all DMSP-peculiar facilities, equipment, and software which will provide mechanical, electrical and data processing support during integration and test in the factory and at the launch base.

Allocation of system requirements to the space segment is translated into the following segment-level requirements and interfaces.

a. Stable platform with pointing requirements to support location of imagery within $\pm$.25 nmi relative to the geodetic coordinate system.

b. Primary sensor providing visible and IR imagery, both with resolutions of 0.3 nmi for regional coverage and 1.5 nmi for global coverage, contiguous at the equator for consecutive orbit revs. Details of coverage, timeliness, and data refresh rates shall be as specified in the SRD.

c. Mission sensors providing specialized meteorological, oceanographic and solar-geophysical data. Data resolutions, accuracies, location correlation, timeliness, and refresh rates shall be as specified in the SRD.

d. Onboard storage of regional and global coverage imagery data, as defined in 3.2.1, to bridge worst case gaps in ground station support, with the latter including mission sensor and status telemetry data. Storage capacity shall include up to four orbit revs of global data and up to two 0.2-rev segments of regional coverage data.

e. Transmission of stored mission data, as defined in d above, during a single ground station pass of at least 10 minutes duration, for use by the US and the C^3S.

f. Transmission of real-t ime mission data, on command, to tactical terminals of the US.

g. Transmission of real-time EST to enable verification of ascent and control of on-orbit operations by the C^3S.

h. Encryption of each downlink data stream.

i. Reception and processing of real-time and stored program commands and of computer memory uploads from the C^3S.

j. Decryption and authentication of all uplink transmissions will be incorporated starting with F-P.

k. Propulsion and steering to inject satellite into the mission orbit specified in 3.2.1, with the capability of compensating for LV injection errors of up to 3 sigma.

3.7.2 Command, Control & Communications Segment. The C^3S shall include all the earth-based facilities, hardware, and software needed to receive status TM and stored data, and to exercise command and control over each DMSP satellite. In addition, it shall include the land line and satellite data links to relay, as applicable, downlink and uplink data between C^3S components and to the US.

Coverage by the C^3S shall be such that it can perform command and control of an anomalous satellite at least once per orbit rev, and that stored mission data as defined in 3.2.1 can be read out by each satellite at intervals ranging from one to four orbit revs such that timeliness and data refresh rate requirements can be satisfied for the system as a whole.

Allocation of system requirements to the C^3S is translated into the following segment-level requirements and interfaces:

a. Generation, encryption as necessary, and transmission of real-time and stored program commands, and of onboard computer memory uploads.

b. Reception, and decryption where necessary, of real-time status telemetry.

c. Reception, and decryption where necessary, of stored data, and relay of same to the US for processing and for delivery to the AFGWC for display and analysis as specified. In a similar sense, the stored data is relayed via satellite data links to FNOC for processing and delivery to Navy users. A stored data stream containing status telemetry data shall be processed by the C^3S for display and analysis.

d. Communications satellite links to relay stored data from the C^3S to Sites 3 and 29 of the US. In addition, these links shall be utilized to relay real-time EST, boost TM data, and special diagnostic on-orbit dwell data to the CCCS, as well as command and upload data

in the opposite direction. These links shall also be utilized for the transfer of computer files for C^3S housekeeping operations such as planning, antenna pointing, etc. Communication links between the present backup (AFSCF) and the C^3S are data-quality telephone circuits as described in e below.

e. Data-quality telephone land line circuits to back up the satellite data links to carry selected C^3S data streams.

f. Process tracking and ephemeris data to support satellite acquisition and tracking by the C^3S, and US real-time terminals and to uplink ephemeris data for use by the satellite and for inclusion in mission data.

g. Personnel to plan, execute and monitor satellite operations through the use of the telemetry, command and control, data processing, and analysis functions of the C^3S hardware and software.

3.7.3 User Segment. AFCWC shall receive the environmental data from the DMSP satellite as relayed by the C^3S, through Site 3. The AFCWC shall receive, process and disseminate global weather and other environmental data to support the Air Force and Army requirements. The FNOC, which receives its environmental data from the C^3S through Site 29 via communication satellite data links, provides similar services to support Navy and Marine Corps requirements. Tactical terminals receive their data directly from the satellite.

3.7.3.1 Centrals

Allocation of system requirements to the US is translated into the following segment-level requirements and interfaces:

a. AFCWC capability to receive and decrypt DMSP mission data, relayed by the C^3S via the comsat links. FNOC is expected to have a similar

capability. Based upon their requirements, AFGWC and FNOC acquire, process, enhance, and display the pertinent data.

b. Acquisition, processing, and enhancement of data transmitted by the National Oceanic and Atmospheric Administration (NOAA) TIROS-N and Advanced TIROS-N (ATN) satellites, as a supplement to DMSP data, in accordance with each service's requirements.

c. Provision shall be made for the acquisition, processing, and enhancement of data transmitted by the NOAA Geostationary Operational Environmental Satellite (GOES) satellites, as a sqplement to DMSP data, in accordance with each service's requirements.

d. An interactive, highly automated Satellite Data Handling System (SDHS) for expansion and enhancement of environmental satellite data manipulation. The SDHS shall ingest, store, process, and display DMSP, TIROS-N, NOAA/National Environmental Satellite Service (NESS), GOES, and weather facsimile (WEFAX) data which will allow AFGWC to blend data from conventional weather data sources with satellite-derived data and to build environmental data products for the DOD user community.

e. Personnel trained to translate strategic and tactical users' data requirements into operational inputs for the payload activation messages to the US, to process and analyze meteorological satellite data, and to prepare data products in conformance to the users' requirements.

3.7.3.2 Tactical Terminals

The US tactical terminals shall be capable of receiving and processing tactical environmental data, in selected areas, to provide direct support to major theater and unit commands of all U.S. Armed Forces. Navy shipboard and ground-based terminals having similar requirements and capabilities are not part of the DMSP system.

Allocation of system requirements to the US real-time terminals is translated into the following segment-level requirements and interfaces:

a. Reception, decryption, processing and display of real-time mission data.

b. Receiving antenna system to acquire and track the DMSP satellites.

c. Provision of tailored weather imagery to key decision makers in the tactical environment.

d. Provision of weather imagery to supplement local forecasting and analysis at the Joint Typhoon Warning Center and at other DOD-designated locations.

e. Acquisition, processing, and enhancement of data transmitted by the NOAA TIROS-N and ATN polar orbit meteorological satellites, as a supplement to and in the same manner as DMSP data, and in accordance with each service's requirements.

f. Acquisition, processing, and enhancement of WEFAX data transmitted by the NOAA GOES, the Geostationary Meteorological Satellite (GMS) operated by the Japanese Space Agency, and the Geostationary METEOSAT operated by the European Space Agency (ESA), as a supplement to and in the same manner as DMSP and in accordance with each service's requirements.

g. Provision for transportability of DMSP tactical terminals by MAC aircraft with a maximum 8-hour setup time and a like teardown time. Fixed and shipboard terminals need not satisfy the requirements for rapid (air) deployment.

h. Personnel trained to acquire, process, analyze, and disseminate meteorological satellite data, and to deploy tactical systems.

i. Support to all US real-time terminal sites shall cover material supply by the Sacramento Air Logistics Center at McClellan Air Force Base (SM-ALC), maintenance by the Air Force Communications Command (AFCC), and training by the Air Training Command (ATC), either at Lowry AFB or by a mobile training team.

3.7.4 Launch Vehicle Requirements. The Launch Vehicle shall provide the lift capability to place the DMSP satellite in a transfer orbit whose apogee is at mission orbit altitude.

Allocation of system requirements to the LV is translated into the following requirements and interfaces:

a. Expendable launch vehicle to deliver satellite into a transfer orbit from which it can attain an orbit of nominal 450 nmi orbit altitude, consistent with the requirements of 3.2.1.1.2.

b. Ascent guidance software for radio or inertial guidance of the flight vehicle to satellite separation from the ELV.

c. Interface logic and circuitry for primary and backup N/satellite separation sequence.

d. Launch support consisting of the launch complex, environmental shelter and other support facilities, range facilities, assembly and checkout facilities, and ground support equipment consisting of ACE and launch-site-peculiar handling equipment.

3.8 PRECEDENCE.

The order of specification precedence shall be: (1) the Requirements of this Specification, (2) the System Segment Specifications, and (3) Subordinate Configuration Item Specifications, except that application of specifications and standards referenced herein shall be as tailored in the segment specifications.

3.8.1 Conflicts. In the event of conflict between the documents referenced herein and the contents of this specification, the latter shall be considered the governing requirement unless the conflict involves interface requirements external to the system. In that event--such as in the case of a conflict with equipment external to the system being specified, with specifications of other referenced system items, or with government furnished property--the order of precedence shall be as directed by the contracting officer.

3.8.2 Requirements Weighting Factors. The requirements stated herein are a composite of the designs, items, and practices found to be cost effective for high reliability devices used in space systems. Because of the broad scope of these requirements, all requirements stated are not of equal importance or weight. They have been divided into four categories of importance, ranging from requirements that are imposed on all applications to examples of acceptable designs, items, and practices. The relative weightings or requirements are incorporated so they can be a consideration in making trade studies of alternatives. The weighting factors that are incorporated in the specification are:

a. Weighting factor "a". "Shall" designates the most important weighting level, the mandatory requirements. Unless specifically tailored out or modified by the contract, they constitute the firm contractual compliance requirements. Any deviations from these contractually imposed mandatory requirements require the approval of the contracting officer.

b. Weighting factor "b". "Shall, where practical", designates requirements, items or practices at the second weighting level. Alternative designs, items, or practices may be used for specific applications when the use of the alternative is substantiated by documented technical trade studies. These trade studies shall be made available for review when requested or provided to the government in accordance with the contract provisions. Unless required by other contract provisions, noncompliance with the "shall, where practical" requirements does not require approval of the contracting officer, but does require documented technical substantiation.

c. Weighting factor "c". "Preferred" or should" designates the third weighting level. Unless required by other contract provisions, noncompliance with these preferred requirements do not require approval of the contracting officer but do require documented technical substantiation.

d. Weighting factor "d". "May" designates the lowest weighting level. In some cases these "may" requirements are stated as examples of acceptable designs, items, and practices. Unless required by other contract provisions, non-compliance with the "may" requirements does not require approval of the contracting officer and does not require documented technical substantiation.

3.8.3 Life Cycle Cost. System life cycle cost estimates shall be used as an additional engineering tool to establish the order of precedence among alternatives. Although all of the requirements specified herein are believed essential, the relative importance of the design requirements shall be determined by giving equal consideration to the minimizing of system life cycle cost and the satisfaction of the totality of performance and physical characteristic requirements stated. All requirements other than the system performance, the physical characteristics, and the system life cycle cost shall be considered of lesser importance.

3.8.4 Supplementary Specifications and Standards. When a detail or general military specification exists for the class of material required, the contractor's specification shall reference the existing military specification and set forth only the needed new requirements and deviations. If required by the contract, the supplementary specifications which are prepared by the contractor shall be submitted to the contracting officer for review or approval prior to their use. In that case, the contracting officer may require data substantiating the supplementary requirements and may require samples of testing. The use of contractor specifications shall not constitute waiver of government inspection requirements.

SECTION 4

QUALITY ASSURANCE PROVISIONS

4.1 GENERAL

Tests and evaluations shall be conducted to verify that the design and performance of the system will meet or exceed the requirements specified herein and in the segment specifications, as applicable. A program of tests, demonstrations, and inspections, augmented by analysis, shall be conducted to verify compliance with the requirements of the specifications. System test objectives shall be implemented in accordance with the applicable system segment test plans.

Methods of verification shall be those defined below:

Inspection: Visually verifies form, fit, and configuration of hardware and of computer programs.

Demonstration: Verifies the required operability of hardware and computer programs (CPs), without the aid of test devices.

Analysis: Verifies conformance to requirements. The verification is based on studies, calculations, and modeling.

Test: Verifies conformance to required performance/physical characteristics and design/construction features by instrumented functional operation and evaluation techniques.

Similarity: Verifies that system components satisfy their requirements. The verification is based on the certified usage of similar components under identical or similar operating conditions.

4.1.1 Responsibility for Inspection and Tests. The segment contractors shall be responsible for all demonstrations and tests, applicable to their respective segments during system and segment-level tests, including those performed by subcontractors. Except as otherwise specified, the contractors may use their own or any other facilities suitable for the performance of the demonstration and test requirements specified herein, unless disapproved by the government. The government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to ensure that supplies and services conform to prescribed requirements.

4.1.2 Classification of Demonstrations and Tests. The tests and demonstrations specified herein are classified as follows:

a. Parts, materials, and process controls (4.2.1)
b. Design verification tests (4.2.2)
c. Qualification tests (4.2.3)
d. Acceptance tests (4.2.4)
e. Service life verification tests (4.2.5)
f. Prelaunch validation tests (4.2.6)
g. Operational tests (4.2.7)
h. Independent validation of computer programs (4.2.8)

These categories are intended to encompass all tests and inspections required during the system acquisition.

4.1.3 Calibration. The accuracy of instruments and test equipment shall be periodically verified by the calibration procedures specified in MILSTD-45662.

4.2 QUALITY CONFORMANCE INSPECTIONS

4.2.1 Parts, Materials, and Processes Controls. PMP controls are to be applied during production of all items to ensure that a reliable system is fabricated. All parts and materials shall be adequately controlled and inspected prior to assembly. During fabrication of the flight elements of the space segment, the tools and processes, as well as parts and materials, shall be adequately controlled and inspected to ensure compliance with the approved manufacturing processes and controls.

4.2.1.1 Records. Records documenting the status of all operational system equipment shall be maintained following assignment of serial numbers. Each item shall have inspection records and test records maintained by serial number to provide traceability from system usage to production lot data for the devices. Complete records shall be maintained for all operational equipment and shall be available for review during the service life of the system. The records shall indicate all relevant test data, all rework or modifications, and all installation and removals for whatever reason.

4.2.1.2 Production Screens. Each critical component within the system shall be subjected to in-process production screens, to ensure compliance with the specified requirements to the extent practical, and to identify non-compliant items at the lowest practical level of assembly. The compliance with the baseline process controls, documented screening requirements, required hardware configuration, and general workmanship requirements shall be verified by inspection.

4.2.2 Design Verification Tests. Design verification testing shall be performed to demonstrate compliance of new designs or of modified designs with the specified performance margins. Test units shall be sufficiently similar to the final production units so as to not jeopardize the validity of the test results.

4.2.3 Qualification Tests. Qualification testing is required only for the flight elements of the space segment. Qualification test requirements for the SS are defined in SS-YD-860.

4.2.4 Acceptance Tests. Acceptance tests shall be performed as the basis for acceptance of items manufactured. Acceptance tests, including lot certification testing, is that testing performed to demonstrate confidence that production devices, which have passed the in-process production screening (see 4.2.1.2), will meet the specified requirements for system performance.

4.2.4.1 Computer Programs. Computer programs shall be verified and validated at the segment level. At the system level, functional testing shall be conducted to demonstrate compliance with specified requirements under nominal and anomalous conditions.

4.2.5 Service Life Verification Tests. Service life verification tests are defined as those tests conducted on limited life devices to demonstrate that production devices will perform satisfactorily during their specified service life. Explosive ordnance devices and other components whose performance may degrade with time shall have life extensions based upon passing either an aging surveillance test or an accelerated aging test.

4.2.6 Operational Tests. Although not a defined part of DMSP, the FNOC provides a function for the Navy that, in a large sense, duplicates the AFGWC function for the Air Force. FNOC will participate in the Comnand System Test and the Operational Command Test described in Paragraphs 4.2.6.1 and 4.2.6.2, respectively, in a manner similar to that performed by the AFGWC.

4.2.6.1 Command System Test. The CST shall be conducted with the space segment at the factory or at the launch base, and shall consist of a RT integration test between the SS and the C^3S using landlines for transmission of uplink and EST downlink data. Compatibility of the space segment mission data downlinks with the C^3S and US shall be demonstrated by playing RT mission data and stored data recorded during the CST and during factory tests

back at the PTF for local processing of both: stored data shall be played back from one or more ground stations via the comsat links into the AFGWC, and RTD into at least one tactical terminal of each type.

The CST shall be repeated for each satellite unless there have been no functional changes in any of the system segments.

4.2.6.2. Onerational Command Test. The OCT shall be conducted with the space segment at the launch base, and shall consist of a RT integration test between the SS, on the one hand, and the C3S, the tactical terminal simulated by the PTF, and the AFGWC on the other, and with the communication links in a configuration as close as possible to the operational one. It shall include compatibility verification of the RF uplinks and downlinks betweem the SS and the Vandenberg Tracking Station (VTS).

Compatibility of the space segment mission data downlinks with the C3S and US shall be demonstrated by playing RT and 6tored mission data back at the PTF for local processing of both. Stored data recorded during the OCT and during factory tests shall be played back from one or more ground stations via the comsat links into the AFGWC, and RTD into at least one tactical terminal of each type.

The OCT shall be repeated for each satellite, except that it may be limited to the VTS Compatibility Test, if there have been no functional changes in any system segment.

4.2.6.3 Dress Rehearsals. At least one demonstration rehearsal and one dress rehearsal shall be conducted involving hardware, software, and personnel of the C3S, US and SS, during which the Advanced Flight Vehicle Simulation Facility (AFVSF) element of the C3S simulates the Space Segment in a range of nominal and anomalous ascent and on-orbit operations. | 004

4.2.6.4 Early Orbit Operations Tests. These tests occur after transition of the satellite from the ascent to the operationalorbit. All spacecraft,

OLS, and mission sensor systems shall be tested in all modes, including backup configurations where practical. Signature data shall be gathered to provide a baseline for future operations.

4.2.7 Independent Validation of Computer Programs. All computer programs performing on-line operational functions in any DMSP segment shall be subject to independent verification and validation (IV&V).

SECTION 5

PREPARATION FOR DELIVERY

5.1 GENERAL

Delivery of a CI or lower level unit for incorporation into any of the DMSP segments shall be in accordance with Section 5 of the applicable specification.

5.2 STORAGE

The satellite. ASE components, and spares, except for items specifically identified as being age sensitive, shall be capable of being stored for periods of at least 2 years without requiring major repair or maintenance at the end of storage.

SECTION 6

NOTES

6.1 INTENDED USE

The DMSP SS, C^3S, and US are intended for use in the Defense Meteorological Satellite System to support worldwide strategic and tactical DOD operations.

6.2 ORDERING CONTRACTUAL DATA

6.2.1 Precedence Requirements. For precedence requirements, see 3.8.

6.2.2 Trade Studies. Trade studies critical to the development process will be identified and specified by the SOW. The system life cycle cost model to be used for trade studies of various alternatives will be critical to the acquisition process, particularly in the early phases. For that reason, the government will reserve the option to determine whether the model will be GFE or will require government approval. If the system life cycle cost model is developed by the contractor(s), the government reserves the right to require delivery in a useable form to ensure its availability for subsequent phases or for use by other contractors.

6.2.3 Technical Review. The government plans for conducting technical reviews and audits will be as stated in the contract.

6.2.4 Contractual Data Items. The requirements for the delivery of data items critical to understanding the acquisition status will be as stated in the Contract Data Requirements List (CDRL). This includes a data item for the delivery, on request, of internally generated contract or documentation.

6.3 DEFINITIONS

Reserved

6.4 ABBREVIATIONS AND ACRONYMS

ACA	Assembly and Checkout Area at VAFB	
AFB	Air Force &se	
AFCC	Air Force Communications Command	
AFGWC	Air Force Global Weather Central	004
AFS	Air Force Station	
AFSCN	Air Force Satellite Control Network	004
(AF) WTR	(Air Force) Western Test Range	
AGE	Aerospace Ground Equipment	
AGS	Ascent Guidance Software	
AKM	Apogee Kick *Motor*	
ANSI	American National Standards Institute	
ARTS(S)	Automated Remote Tracking Station(s)	004
ASE	Aerospace Support Equipment	
ATC	Air Training Command	
ATLAS	Abbreviated Test Language for Avionics Systems	
ATN	Advanced TIROS-N	
AWS	Air Weather Service	
b/s	Bits Per Second	
C3S	Command, Control & Communication Segment	
CDR	Critical Design Review	
CDRL	Contract Data Requirements List	
CI	Configuration Item	
CNOC	Commander, Naval Oceanography Command	
COM *(M)*	Communications	
comsat	Communications Satellite	
CSTC	Consolidated Space Test Center	004
csoc	Consolidated Space Operations Center	

COMSEC	Communications Security	
CP	Computer Program	
CPC	Computer Program Component	
CPCI	Computer Program Configuration Item	
CPCP	Contamination Prevention and Control Program	
CPM	Computer Program Module	
CPU	Central Processing Unit	
CRS	Command Readout Station(s) of the 1G (Sites 1 & 2)	
CRT	Cathode Ray Tube	
CST	Command System Test	
CT	Cipher *Text* ("Black Data")	
dB	Decibel	
DECCO	Defense Commercial Communications Organization	
DOMSAT	Domestic Satellite	004
DMSP	Defense Meteorological Satellite Program	
DMSS	Defense Meteorological Satellite System	
DoD	Department of Defense	
DRS	Data Reconstruction Site at AFGWC (Site 3)	
DSIS	Defense Communications System/Satellite Control Network Interface System	004
ECI	Earth Centered Inertial	
ELV	Expendable Launch Vehicle	
EMC	Electromagnetic Compatibility	
EMI	Electromagnetic Interference	
EO	Early Orbit	
ESA	European Space Agency	
EST	Equipment Status Telemetry	

FIPS	Federal Information Processing Standard
FLP	Flight Software Load Package
FMECA	Failure Modes and Effects Criticality Analysis
FNOC	Fleet Numerical Oceanography Center
FVSF	Flight Vehicle Simulation Facility
GDC	General Dynamics Convair
GE	General Electric Company
GERTS	General Electric Radio Tracking System
GFE	Government Furnished Equipment
GFP	Government Furnished Property
GMS	Geostationary Meteorological Satellite operated by Japanese Space Agency
GOES	Geostationary Operational Environmental Satellite operated by the NOAA
GSE	Ground Support Equipment
GSE&I	General Systems Engineering and Integration
Handover	Transition from Ascent to Orbit Operations Mode
HTS	Hawaii Tracking Station of the AFSCF
IOC	Initial Operation Capability
IR	Infrared
IV&V	Independent Verification & Validation of Computer Programs
JCS	Joint Chiefs of Staff
kb/s	Kilobits per second = 1,000 bits/second
L	Primary Sensor Visible Light Data
LF	Primary Sensor Light Fine (Data)
LS	Primary Sensor Light Smooth (Data)

LV	Launch Vehicle
MAC	Military Airlift Command
Mb/s	Megabits per second = 1,000,000 bits/second
MD	Mission Duration
METEOSAT	Geostationary Meteorological Satellite operated by European Space Agency
MMD	Mean Mission Duration
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MRB	Material Review Board
NESS	National Environmental Satellite Service
nmi	Nautical Mile
NOAA	National Oceanic and Atmospheric Administration
NORAD	North American Aerospace Defense
NSA	National Security Agency
OAFB	Offutt Air Force Base
OCT	Operational Command Test
OLS	Operational Linescan System
OMS	Orbital Mode Software
OR	Operational Requirement
ORD	Orbital Requirements Document
ORG	Operational Requirements Group
PAM	Payload Activation Message
PANS	Mission Planning Support Subsystem
PMD	Program Management Directive
PMP	Parts, Materials, and Processes

PS	Probability of Success
PST	Pre-Shipment Test
PT	Plain Text
PTF	Payload Test Facility at VAFB (Site 4)
QA	Quality Assurance
R&D	Research and Development
rev(s)	Orbit Revolution(s)
RF	Radio Frequency
RFI	Radio Frequency Interference
R/I	Readin of data into onboard tape recorder
R/O	Readout of data from onboard tape recorder
RT	Real-Time
RTD	Real-Time Mission Data
RTS	Remote Tracking Station(s) 004
SAA	Satellite Analysis Area at the 1000 SOG
SAMTEC	Space and Missile Test Center
SAMTO	Space and Missile Test Organization
S/C	Spacecraft
SCAP	System Concepts and Procedures
SCC	SPADOC Computational Center
SD	Space Division of Air Force Systems Command
SDF	Software Development Facility or Stored Data Fine
SDHS	Satellite Data Handling System
SDMF	Software Development and Maintenance Facility
SDS	Stored Data Smooth

SGLS	Space Ground Link System
SGS	Strategic Ground Segment
SITP	System Integrated Test Plan
SLC	Space Launch Complex
SM-ALC	Sacramento Air Logistics Center
SCC	Satellite Operations Center (Site 5)
SOG	Satellite Operations Group
SON	Statement of Operational Need
SOW	Statement of Work
SPACECOM	Air Force Space Command
SPADOC	Space Defense Operations Center
SPC	Satellite Processing Center at FNOC (Site 29)
SPO	Air Force System Program Office
SRD	System Requirements Document
SS	Space Segment
STC	Satellite Test Center of the AFSCF
STE	Special Test Equipment - AGE for OLS
STESTG	Satellite Test Group
STRB	System Test Review Board
T	Primary Sensor Thermal (IR Data)
TBD	To Be Determined
TBS	To Be Specified or Supplied
TED	Threat Environment Description
TF	Primary Sensor Thermal Fine (IR Data)
TGS	Tactical Ground Segment

TIROS-N	Television Infrared Observation Satellite NOAA Polar Orbit Meterological Satellite
TL	Mission Life
TM	Telemetry
TRB	Test Review Board
TS	Primary Sensor Thermal Smooth (IR Data)
TT	Tactical Teninals
TT&C	Telemetry, Tracking and Command
TTS	Transportable Terminal System(s)
UPS	Uninterruptible Power Supply
ls	User Segment
VAFB	Vandenberg Air Force Base
VECO	ELV Vernier Engine Cutoff
VTS	Vandenberg Tracking Station of the AFSCF
WEFAX	Weather Facsimile
WSMC	Western Space and Missile Center
lG	1000th Space Dperatims Group (1000 SOG)

6.5 GUIDANCE DOCUMENTS

The following documents provide information and data that may be useful in the allocation of the stated requirements to lower levels of assembly or in the preparation of more detailed documentation required by the acquisition process:

6.5.1 Government Documents

Specifications:

Space Division

IS-YD-810A*	5D-2 OLS/5D-2 Spacecraft
15 Nov 76	Interface Specification
IS-YD-811A*	Special Sensor/Spacecraft Interface
30 Aug 78	Specification for the Block 5D-2 Configuration of the DMSP system
IS-YD-812A	Ether Interface Specification for the
2 Apr 79	Block 5D-2 Configuration of the DMSP Spacecraft
SI-YD-100	5D-2 System Integrated Test Plan
18 Aug 81	
SI-YD-101	5D-2 Integrated Ground Segment Test Plan
4 Sept 81	
Chg 1 - 18 Sept 81	

*Documents to be used for guidance only until superseded by RCA IS-2298450 and the ICDs for individual sensors identified in RCA IS-2298451, such as RCA IS-2298452 for the OLS.

SI-YD-102	5D-2 Launch Mission Integration
11 Feb 81	Management Plan (Draft)
(TBS)	DMSP Performance Verification Plan (Draft)

Contractor

RCA IS-2298450	Interface Specification Block 5D-2
(TBS)	Spacecraft/Sensors Interface
RCA IS-2298451	Interface Control Document Block 5D-2
(TBS)	Spacecraft/Sensors Interface Documentation
RCA IS-2298452	Interface Control Document Block 5D-2
(TBS)	Spacecraft/OLS Interface

Standards

MIL-STD-1815	ADA Programming Language
10 Dec 80	

6.5.2 Non-Government Documents.

AMERICAN NATIONAL STANDARDS INSTITUTE

ANSI X3.9-1978 3 Apr 78	American National Standard Programming Language FORTRAN
ANSI/IEEE 260-1978 (Formerly Y10.19)	Standard Letter Symbols for units of Measurements.

(Copies of these publications may be obtained from the contracting office or as directed by the contracting officer. Technical society and technical association publications are generally available for reference from libraries)

6.6 TAILORED APPLICATIONS

It is intended that the requirements in documents referenced in this specification are called out in wording which properly tailors the requirement for each application, either in this or in the applicable segment specification. Nevertheless, all requirements of this specification, including referenced requirements, should be evaluated for each application, and those that are inappropriate, or that seem to increase system life cycle cost, should be identified and reviewed. The stated order of precedence of requirements, including the use of the weighting factors in the specification, is intended to assist contractors in the design process, in trade studies, and in the allocation of requirements to specific applications. Contractors are encouraged to identify to the contracting officer, for program office review and consideration, any requirements imposed by this specification that are believed excessive or conflicting. However, contractors are reminded that deviations from contractually imposed requirements can be granted only by the contracting officer.

SRA CORPORATION

4 MAR 1991

RECEIVED

Final CCB-Approved SCNs for DMSP - 300 a n d IS-DMSP-853

(CDRL 006A2)

04 March 1991

SUBMITTED TO:

SSD/MW (DMO)
P.O. Box 92960
Los Angeles, CA 90009-2960

Systems Research and Applications Corporation
550 North Continental Boulevard, Suite 190 • El Segundo, CA 90245 • 213/322-1174 • FAX 213/322-0268
2000 15th Street • North Arlington, VA 22201 • 703/558-4700

4 March 1991
ET-91 -067

SSD/MW (DMO)
P.O. Box 92960
Los Angeles, CA 90009-2960

Attention: Brock Coy

Reference: (1) SSD/PKW Letter Dated 05 February 1991
(2) SRA Contract FO4701-66C-0102, CDRL 006A2

Subject: **Final Submittal of Two CCB-Approved SCNs (with comments), One Each for DMSP-300 and IS-DMSP-853**

In accordance with Reference 2, SRA/DSEC is pleased to submit ten (10) copies of each of the two subject approved Specification Change Notices, per Reference 1. It is noted that those comments contained in Reference 1 that are particular to IS-DMSP-904 will be separately incorporated into that document upon its CCB-approval.

Should you have any questions regarding this matter, please contact Fred Lawler at (213) 322-l 174.

Sincerely,

John W. Overton
DSEC Deputy Program Manager

Distribution:

MWSI (Capt Jurgelewicz)
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SPECIFICATION CHANGE NOTICE
(SEE MIL-STD-490 FOR INSTRUCTIONS)

DATE PREPARED 01 Feb 91

ORIGINATOR NAME AND ADDRESS	2	3. CODE IDENT.	4. SPEC. NO.
SRA Corporation 550 N Continental Blvd. Suite 190 El Segundo. CA 90245	☐ PROPOSED ☒ APPROVED	OEEH4 5. CODE IDENT OEEH4	DUSP-300 6. SCN NO. 004

SYSTEM DESIGNATION	8. RELATED ECP NO.	9. CONTRACT NO.	10. CONTRACTURAL ACTIVITY
DMSP	SRA ECP 003R1	F04701-88-C-0102	

1. CONFIGURATION ITEM NOMENCLATURE	12. EFFECTIVITY
General System Performance Specification for DMSP	N/A

THIS NOTICE INFORMS RECIPIENTS THAT THE SPECIFICATION IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS SCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATA AS THIS SCN. THE PAGES OF THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGE PAGES. COMBINED WITH NON-LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4. CONSTITUTE THE CURRENT VERSION OF THIS SPECIFICATION.

14 SCN NO.	PAGES CHANGED (INDICATE DELETIONS)	* S	* A	15 DATE
	Pages Changed and Submitted Herewith.			
004	i. ii. iii. vi vii. viii. ix	X		1 Feb 91
	9-10. Paragraph 3.1.1.2	X		
	18. Paragraph 3.1 7 1.1	X		
	22. Paragraph 3 1.7.2.8	X		
	24. Paragraph 3.2.1 .1.1	X		
	28. Paragraph 3.2.1.1.6 1	X		
	33. Paragraph 3.2.5	X		
	61. Paragraph 4.2.6 3	X		
	65-66. Paragraph 6.4	X		
	69. Paragraph 6 4	X		
	Summary of Previously Changed Pages			
001	RELATED ECP 7006-001C1 iii i. 31 viii. ix	X	X	27 Jul 84
002	85-001R2 ii, vii. ix. 28	X		30 Apr 85
003	001R2 viiii. ix, 9. 21. 22	X		21 Jul 89
TBD	002 Withdrawn			N/A

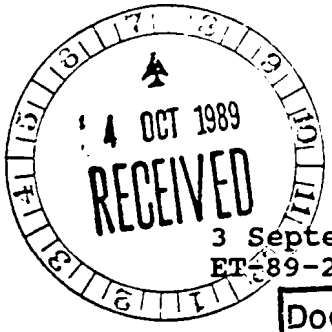
16. TECHNICAL CONCURANCE: [signature] DATE 11 APR 91

FORM 1696
1 DEC 68

* "S" indicates supersedes earlier page. "A" indicates added page

CWDIC

SRA CORPORATION



3 September 1989
ET-89-228

Doc No.	
Date	
Approval Needed	Yes/No

HQ SSD (AFSC)/CWD (DMO)
P.O. Box 92960
Los Angeles, CA 90009-2960

Reference: SRA Contract F04701-88-C-0102
CDRL 006A2 Specification Maintenance Document (Equipment/Munitions) (Re-Submittal)
SCN 003 to Specification DMSP-300
SCN 001 to Specification IS-DMSP-853

Enclosed are 12 (twelve) copies of each Specification Change Notice, which were approved by the contract officer on 29 September 1989.

Should you have any questions regarding this matter, please contact Brad Aniya at (213) 322-1174.

Sincerely,

for E. Tagliaferri
DSEC Program Manager

Attachments:

Distr. CWDI (Capt Wesling) (2)
PKWJ (3)
CWDA
CWDE
CWDG
CWDIC (2)
CWDM
CWDS
Aerospace Corporation

ACO

DISTRIBUTION	
PROJECT OFFICER:	
CWDI CAPT WESLING	2
PKWJ	3
CWDA CWDS	
CWDE AEROSPACE	
CWDG	
CWDIC BRECK	
CWDM	

Systems Research and Applications Corporation
550 North Continental Boulevard . El Segundo, CA 90245 . 213/322-1174
2000 15th Street • North Arlington, VA 22201 • 703 558-4700

(SEE MIL-STD-490 FOR INSTRUCTIONS) DATE PREPARED 01 Feb 91

. ORIGINATOR NAME AND ADDRESS SRA Corporation 550 N Continental Blvd. Suite 190 El Segundo. CA 90245	2 ☐ PROPOSED [X] APPROVED	3. CODE IDENT. OEEH4 5. CODE IDENT OEEH4	4 SPEC. NO. DMSP-300 6. SCN NO. 004
.. SYSTEM DESIGNATION DMSP	8. RELATED CCP NO. SRA CCP 003R1	9. CONTRACT NO. F04701-88-C-0102	10. CONTRACTUF
11. CONFIGURATION ITEM NOMENCLATURE General System Performance Specification for DMSP		12. EFFECTIVITY N/A	

MIS NOTICE INFORMS RECIPIENTS THAT THE SPECIFICATION IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANCED. THE PAGES CHANCED BY THIS SCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATA AS 'THIS SCN THE PAGES OF THE PACE NUMBERS AKD DATES LISTED BELOW IN THC SUMMARY OF CHANGE PAGES. COMBINED WITH NON-LISTED PACES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4. CONSTITUTE THE CURRENT VERSION OF THIS SPECIFICATION.

13 SCN NO.	14 PAGES CHANCED (INDICATE DELETIONS)	• S	• A	15
	Pages Changed and Submilled Herewith			
004	i. ii. iii. vi. vii. viii. ix	X		1 Fe
	9-10. Paragraph 31.1 2	X		
	18. Paragraph 3 1.7.11	X		
	22. Paragraph 3.1 7.2.8	X		
	24. Peragraph 3.2 11.1	X		
	28 Paragraph 32 1.1.6 1	X		
	33. Paragraph 3.25	X		
	61. Paragraph 4 263	X		(
	65-66. Paragraph 64	X		
	69 Paragraph 64	X		
	Summary of Previously Changed Pages			
001	RELATED ECP 7006-001C1 — iii. 31; viii. IX	X	X	27 Ju
002	85-001R2 — ii. vii. ix. 28	X		30 A
003	001R2 — viii. ix. 9. 21. 22	X		21 Ju
TBD	002 — Withdrawn			N/

16. TECHNICAL CONCURANCE

DATE 11 '4

DD FORM 1696 1 DEC 68

"S" indicates supersedes earlier page. "A" indicates aaded p

SPECIFICATION CHANGE NOTICE

(SEE MIL-STD-490 FOR INSTRUCTIONS) DATE PREPARED 21 July 1989

1. ORIGINATOR NAME AND ADDRESS	2	3. CODE IDENT.	4. SPEC NO
SRA Corporation 50 N. Continental Blvd., Suite 190 El Segundo, CA 90245	☐ PROPOSED ☒ APPROVED	OEEH4	DMSP-300
		5. CODE IDENT. OEEH4	6. SCN NO 003

7. SYSTEM DESIGNATION	8. RELATED ECP NO	9. CONTRACT NO	10. CONTRACTUAL ACTIVITY
DMSP	001R 2	F04701-88-C-0102	

11. CONFIGURATION ITEM NOMENCLATURE	12. EFFECTIVITY
System Performance Spec for DMSP	N/A

THIS NOTICE INFORMS RECIPIENTS THAT THE SPECIFICATION IDENTIFIED BY THE NUMBER (AND REVISION LETTER) SHOWN IN BLOCK 4 HAS BEEN CHANGED THE PAGES CHANGED BY THIS SCN BEING THOSE FURNISHED HEREWITH AN3 CARRYING THE SAME DATE AS THIS SCN THE PAGES Of THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGED PAGES. COMBINED WITH NON-LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4. CONSTITUTE THE CURRENT VERSION OF THIS SPECIFICATION

13 SCN NO	A PAGES CHANGED (INDICATE DELETIONS)	S	A	15 DATE
003	PAGES CHANGED AND SUBMITTED HEREWITH:			
	viii	x		
	ix	x		
	9, Paragraph 3.1.1.2	x		
	21, Paragraph 3.1.7.2.4	x		
	22, Paragrar 3.1.7.2.8	x		
	RELATED ECP / SUMMARY OF PREVIOUSLY CHANGED PAGE!S			
001	7006-001 Cl iii	x		27 July 84
	viii, ix		>	
	31	x		
002	85-001, R2 ii	x		30 Apr 85
	viii	x		
	ix	x		
	28	x		

16 TECHNICAL CONCURRENCE Trudy R. Weakley DATE 30 JUL 89

DD Form 1696, DEC 68 "S" indicates supersedes earlier page. "A" indicates added page

*U.S.GPO 1988-0-181-116

SCN	SCN DATE	PARAGRAPHS AFFECTED
001	27 Jul 84	3.2.2.5
002	30 Apr 85	3.2.1.1.6.1
003	21 Jul 89	3.1.1.2
003	21 Jul 89	3.1.7.2.4
003	21 Jul 89	3.1.7.2.8

SUMMARY OF CHANGED PAGES

PAGE	DATE
i	06 Sep 83
ii	30 Apr 85
iii	30 Apr 85
iv-vii	06 Sep 83
viii-ix	21 Jul 89
1-8	06 Sep 83
9	21 Jul 89
10-20	06 Sep 83
21-22	21 Jul 89
23-27	06 Sep 83
28	30 Apr 85
29-30	06 Sep 83
31	27 Jul 84
32-75	06 Sep 83

SPECIFICATION CHANGE NOTICE
(SEE MIL-STD-480 FOR INSTRUCTIONS)

DATE PREPARED: 30 Apr 1985

1. ORIGINATOR NAME AND ADDRESS
QAO Corporation-Defense System Division
2250 E. Imperial Highway, Suite 600
El Segundo, CA 90245

2. ☐ PROPOSED ☑ APPROVED

3. SPEC. NO.: DMSP-300

4. SCN NO.: 002

5. SYSTEM DESIG.: DMSP

6. RELATED (D) NO.: 85-001 ,R2

7. CONTRACT NO.: F04701-84-C-0027

8. CLASSIFICATION OF MODIFICATION

THIS NOTICE INFORMS RECIPIENTS THAT THE SPECIFICATION IDENTIFIED BY THE NUMBER AND REVISION LETTER(S) SHOWN IN BLOCK 4 HAS BEEN CHANGED. THE PAGES CHANGED BY THIS SCN BEING THOSE FURNISHED HEREWITH AND CARRYING THE SAME DATE AS THIS SCN. THE PAGES OF THE PAGE NUMBERS AND DATES LISTED BELOW IN THE SUMMARY OF CHANGED PAGES, COMBINED WITH NON-LISTED PAGES OF THE ORIGINAL ISSUE OF THE REVISION SHOWN IN BLOCK 4, CONSTITUTE THE CURRENT VERSION OF THIS SPECIFICATION.

13. SCN NO.	14. PAGES CHANGED (INDICATE DELETIONS)	9	A	15. DATE
002	PAGES CHANGED AND TRANSMITTED HEREWITH			
	ii	X		30 Apr 1985
	viii	X		30 Apr 1985
	ix	X		30 Apr 1985
	28	X		30 Apr 1985

16. TECHNICAL CONCURRENCE

DATE

DD FORM 1696

"9" INDICATES SUPERSEDED SHEET/PAGE "A" INDICATES ADDED PAGE

SPECIFICATION CHANGE NOTICE
(SEE MIL-STD-490 FOR INSTRUCTIONS)

DATE (YYMMDD) 27 July 1984

1. ORIGINATOR (NAME AND ADDRESS)	2. [ ] PROPOSED [X] APPROVED	3. CLASS (I, II)	4. DWG. NO.
OAO Corporation 2250 E. Imperial Hwy, Suite 600 El Segundo, CA 90245		07868	DMSP 300
		5. CLASS (GOVT.) UNK	6. SCN NO. 001
7. SPECIFICATION DESIGNATION ISP	8. RELATED DCN NO. 7006-001	9. CONTRACT NO. F04701-84-C-0027	10. ORIGINATING ACTIVITY P00005
11. CLASSIFICATION (THIS DOCUMENT) DMSP		12. EFFECTIVITY (ALL	

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13. SCN NO.	14. PAGES CHANGED (INDICATE DELETIONS)	15. S	A	16. DATE
	PAGES CHANGED AND TRANSMITTED HEREWITH			
001	iii			
	viii		X	
	ix		X	
	31			

17. TECHNICAL CONCURRENCE

DATE

DD FORM 1696

"S" INDICATES SUPERSEDED EARLIER PAGE "A" INDICATES ADDED PAGE